I am greatly honored to present the *Review of Asset Pricing Studies (RAPS)* keynote at the Society for Financial Studies (SFS) North American Cavalcade. I very much appreciate the invitation—especially in light of my background as a member of the Founding Committee of the SFS 35 years ago and later as the second Executive Editor of the *Review of Financial Studies (RFS)* and subsequently as President of the SFS.

My 2020 paper in the *RAPS (2020)* focused upon the comparison of the twin crises—the Financial Crisis (2008) and COVID-19 (2020). In light of this, along with the importance of economic ideas for understanding basic features of COVID-19 as well as the dominant role over the last two years that this disease has played in our society, I will focus my remarks upon how economic thinking can enhance our understanding of both the transmission of the disease and the substantial consequences for asset prices and the broader economy. While epidemiologists focus upon the evolution of transmissible disease, the tools of economics and asset pricing in particular,
potentially bring a unique lens and toolkit to bear—one that has been insufficiently emphasized in societal discussion and decision-making, as well as by our discipline. Economists bring a valuable conceptual framework and empirical designs to explore such questions and bring extraordinary respect for both the importance of data and appropriate theoretical framing. What are the lessons from the COVID-19 pandemic, including ones for the continuing pandemic/epidemic and for a future pandemic? There has been insufficient emphasis on such themes.

What are some of these frameworks and ideas? The lack of transparency, i.e., opacity, and more obviously externalities, are central to understanding the transmission of this disease. In light of the externality, restricting interactions would fight disease transmission, but at a tremendous cost in limiting economic activity—as reflected in the societal approach to the disease in much of 2020; for example, recall “two weeks and then six weeks to stop the spread.” Opacity also is fundamental to COVID-19 due to the substantial incubation period as well as delays in receiving test results, during which the virus can spread dramatically. Promoting transparency, such as

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2 The notion of applying economic ideas and tools to situations arising from other disciplines has a long history, as illustrated, for example, by the classic work of Gary Becker.

3 While the incubation process reflects nature and is exogenous, the delays in testing results were avoidable and a reflection of limited societal resources devoted to testing.
through various testing modalities and even conveying vaccination status, could help limit transmission, possibly at only modest cost relative to alternative ways to limit the spread of the disease. Frequent, substantial and possibly targeted testing may be a fruitful approach given the nature of the benefits and costs (relative to the economic alternatives). Indeed, Paul Romer (2020) advocated for that early during COVID-19 and indeed, the cost of testing has now fallen dramatically. Alternative approaches that reflect sensitivity to the costs of testing include testing wastewater concentrations of the virus, randomized testing in jurisdictions and simultaneous testing of a number of individuals and retesting individuals only in the face of a positive result. The value of testing is now broadly recognized, but early during the COVID-19 and even at the end of 2021 the extent of testing was inadequate. In effect, at a relative modest cost compared to

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5 In December 2021 President Biden mused about how should the government have known that they would have needed more tests? Early in 2022 the federal government did begin to supply free self-administered COVID-19 tests. This signaled to the public the relevance and importance of testing, though two years into the pandemic. One important aspect of the interpretation of overall test results is the focus on the extent of positive test findings, but that depends upon the extent and criteria for test-taking in society. If only the sickest individuals are tested, then selection considerations would lead to a very high frequency of positive results. In contrast, if the samples were truly random rather than selective, then the frequency of positive results would lead to informative comparisons. One overlooked but potentially important cost of random testing to the test takers is the cost and consequences of an unexpected positive result (especially in transit).
the costs imposed upon the economy by COVID-19 one could create considerable transparency, which would be a direct path to challenge COVID-19.

With respect to the externality, limiting interactions to reduce disease transmission not only limits economic activity, but as we have observed, limits the ability to regenerate and grow our society through education in primary schools, universities and even the creation of corporate culture. Of course, there are now ways to limit transmissibility with only modest impacts on economic activity—such as vaccination. Some other approaches to manage the transmission externality can be useful as well, such as masking and especially in some contexts, social distancing of six feet or more, but at the cost of considerable reduction in economic activity. The latter would have great impact upon the capacity of various institutions in society, such as airplanes and even schools. Furthermore, the short-term closure of organizations in which the disease was present or spread (such as meat-packing plants and schools) illustrates the interplay of the transmissibility and economic externalities. Perhaps the most extreme example is the case of a “Zero-COVID” policy in which organizations or even whole cities are shut down. Understanding this interplay seems fundamental. For example, in the context of the current lockdown of Shanghai there appears to be an escalation of deaths from other causes and substantial declines in both
consumption and production. While the Chinese “Zero-COVID” policy is not the only cause of
the recent U.S. and global stock market rout (where the rises in interest rates and energy prices are
more prominent), the Chinese Zero-COVID policy certainly appears to be a significant
consideration, highlighting the various objectives of policy makers and the importance of policy
decision rules.

All of this points to the challenge of identifying a suitable objective function for decision-
making. This raises the broad question of what should be the goals of policy makers and how
should those goals change over time? Should we simply focus upon disease and if so only a single
disease at the cost of reducing dramatically the use of other screening tests and leading to
considerable psychological harm and even mental illness in society.

Similarly, an important component of the challenge is how to think about the control of
disease within an equilibrium context in which people are still located somewhere and don’t simply
disappear by sending them home from the universities or closing the primary schools, i.e.,
individuals sent home can still contract the disease. Of course, we can minimize the spread of
disease, whether COVID or the common call, within a particular school by closing that school—
but, of course, that would not necessarily limit the spread of the disease within society or even necessarily be the proper decision for society. In the case of schooling, preliminary indications suggest that for many individuals a year of remote education was relatively ineffective, especially for those with less access to resources, and that much of the cost will only become clear in the long run. From this perspective it is striking that primary education was not viewed by policy makers as an “essential” activity to be preserved during the pandemic (unlike the portions of Walmart that were not in the grocery business). Yet, at the same time, after a few months private and parochial schools figured out how to make their operations work, resulting in considerable incremental demand from students in public school systems. Indeed the viability of private and parochial programs would have been in doubt absent tuition revenues, presumably explaining in part the different choice by many public vs. private/parochial schools. A contributing factor to the differing decisions was the power and incentives of public school teacher unions in many jurisdictions. Such an agency distortion seems especially troubling in a society which purports to pay so much attention to equity.

While many economic models rely upon stationarity, it is clear that we are not in a stationary world with respect to COVID-19. Of course, there has been tremendous learning and
development of new tools and the underlying disease dynamics and state variables changed dramatically (with changes in societal immunity levels, techniques for addressing COVID-19 and behavior). The learning is apparent at so many levels--such as the development of vaccines and therapeutics with high levels of effectiveness, changing emphases on masking (both plus and minus), much less emphasis on transmissibility by touching, appreciation of the value of high quality air filters and appreciation of the costliness to society of shutting down. On the flip side we have learned so much about how to cope economically with the medical value of greater separation including (a) the power of technologies such as Zoom and (b) the ability of many white-collar professionals to work from home for a significant portion of their efforts. Many of the ideas that we had as a society and even many of the specific recommendations of epidemiologists have not stood the test of time nor aged gracefully. From a broader perspective this is not so surprising--learning is fundamental to growth and economic prosperity.

It is helpful to appreciate more fully how the decision rules of economic actors with respect to activities that would influence disease transmission will impact society more broadly. As economics emphasizes in many contexts, the decision rules of economic actors influence the data that will arise. The application of empirical and econometric methods should reflect this, at least
in part. Interestingly, the range of tools that economists routinely utilize, such as structural estimation, time series and panel estimation seems well-suited to understanding disease transmission. Still, it has been surprising that there has not been even more attention to such analyses to better understand potential optimal behavior. Given the range of decisions undertaken and the range of outcomes, there is much that can be learned through thoughtful analyses of data. From this perspective it has been surprising and even dismaying that the Center for Disease Control and Prevention (CDC) has not been more forthcoming with data available to it (https://www.nytimes.com/2022/02/20/health/covid-cdc-data.html), even asserting that the public would not understand the data. Engaging with experts from various domains would seem to enhance the quality of potential data analyses, while hiding important data would suggest an anti-scientific perspective. Transparency about data and confidence in letting diverse perspectives challenge the data is fundamental to science and the scientific process.

In some contexts structural estimation has been a very useful tool in economics by focusing more directly on the hypothetical optimality of the underlying policy and its importance to the data generation process. It is striking that there appears to be relatively little attempt to try to use such approaches to understand more about the nature of the optimal policy regime or to understand
policy at a causal level. Even separate from choice of method is that there seems to be relatively limited efforts to use the data on disease transmission and severity to understand more deeply the lessons from our overall experience. One basic problem is that the circumstances of different jurisdictions are so different. If New York, California and Massachusetts are more aggressive in limiting interaction, but also have more underlying exposure to disease (e.g., due to its circumstances such as the population density or how people engage) or a more vulnerable population (e.g., older population), it is challenging to make inferences about the effectiveness of various policies. A jurisdiction that was more exposed might naturally find it optimal to undertake more aggressive policies. For example, at the beginning of the pandemic New York was in a particularly problematic situation—with very high case counts and hospitalization rates—one suspects because of transmission through significant transportation systems include commuter railroad, subways and even high-rise elevators. In this sense the challenge is not simply to look at jurisdictions with more favorable statistics. Similarly, the retrospective analyses to date don’t

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6 An interesting effort to use policy decisions to quantify uncertainty in the context of climate change is given by M. Barnett, W. Brock and L. Hansen, August 23, 2021, “Climate Change Uncertainty Spillover in the Macroeconomy.”
suggest that areas that were less locked down performed worse\(^7\)—to a degree they faced a different problem and challenge. Analogously, the zero-COVID policies from China seem to be performing worse than would alternatives, especially once one considers the other health costs and the economic costs. Undertaking careful analyses of such questions is important.

There are many questions that have emerged in the aftermath of the COVID-19 pandemic, not only about the transmission of the disease—but also its impact on fundamental features of the economy. Clearly, the COVID-19 pandemic is changing the way our society functions and the value of many assets. At a fundamental level, the COVID-19 pandemic highlights the importance of risk and uncertainty in our society. Unanticipated surprising events can play an especially important role in the evolution of our economy and society, especially when the ex-ante contingent contracting of agents does not treat the issues in a serious manner. To some degree, though qualitatively different in their own ways: September 11, 2001, the Great Recession and financial crisis (2008) and the COVID-19 pandemic all reflect the importance and challenges of ex ante

contracting and the fundamental importance of risk and uncertainty, which asset pricing is especially well suited to address.

This highlights the importance of a number of ideas that are fundamental to asset pricing—including the Peso problem, which emphasizes that there are a range of events that might arise in the future that have not appeared in a particular historical sample or have only appeared with especially low probability, the distinction between and importance of systematic as contrasted to idiosyncratic risk, systemic risks to our economic system, and the value of optionality and flexibility in our real economy. Events like COVID-19 emphasize the potential significance of events that are not reflected in our historical sample and the importance of out-of-the-box thinking. It also highlights that the true risks faced in our economy are systematic and systemic risks, which cut to the core of markets and the economy, rather than the routine risks reflected in idiosyncratic risk. While September 11, 2001 should have highlighted the importance of addressing low likelihood societal events contractually, I sense that we are much less complacent after COVID-19. At a broader level, one of the true comparative advantages of financial economists as compared to lay members of the society is a recognition of the value of optionality when offered in real or financial contracts. In simplest terms, there is more value available to a party when a contract
offers more flexibility in meeting its contractual obligations. By highlighting in broader terms the
nature of the risk faced by our society, it will be interesting to explore how in the aftermath of
COVID-19 the structure of lease pricing responds due to the importance of optionality (including
the term structure and embedded options).

The context surrounding COVID-19 points to many ways in which the real economy has
changed—to a considerable degree in the long-run and even more dramatically in the shorter-term.
For example, properties and facilities became unusable or needed to be adapted dramatically—yet
at the same time demand for some types of facilities rose substantially. We see indications of very
low utilization of some properties—such as office space in some large cities. This reflects
behavioral adjustments on many margins—the work at home (“Zoom”) movement and resulting
ability to relocate to further from the center city or even to more distant “Zoom towns” or warmer
climates as well as substitution to fewer days in the office, which in turn could suggest redesign
of the traditional office. Of course, the greater use of homes for work (and schooling) has led to
dramatic increases in the demand for at least certain types of residential property. In turn, this has
led to relatively sharp movements in property asset prices and may help cushion the emerging
impact of dramatically higher interest rates on residential asset values. While it would be natural
to anticipate conversions of office properties in the center cities to condominiums, such substitution may be limited in the near term by the challenges to supply that our economy faces due to the continuation of COVID-19, zoning complications, and incentive and liquidity changes that emerged earlier.

This discussion points to important quantity and implicitly price responses as an economy adjusts to the pandemic. It is important that some of these impacts are short-term effects, while others reflect long-term response to learning about the ability to be effectively employed while working from home at least part of the time and perhaps fully. The nature of the price responses in turn highlights the value of flexibility and optionality in the structure of leasing contracts with potential implications for the form of contracting and the value of flexibility and optionality.⁸ To some extent flexibility has been a hallmark of the U.S. economy, but the significance and the degree of flexibility that is relevant has changed substantially. From an asset pricing perspective and broader economic lens, one of the crucial ways to help achieve flexibility is through pricing and price adjustments to incent private actors to redeploy assets in efficient ways. Such responses

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should occur over many margins and various horizons. The duality between quantities and the potential ability to engage in price adjustments is fundamental to the ability of our economic system to respond efficiently to substantial shocks.

As I conclude, I’ll offer a few observations that may be even further from my expertise than disease, i.e., the macro-economy. At a macroeconomic level, a number of important themes with fundamental asset pricing implications to emerge in the aftermath of COVID-19 has been the emergence of an extraordinary inflation in which the Federal Reserve has allowed itself to get far “behind the curve.” At the root of the issue was an attempt to cushion the response to the initial closure of the economy, leading to extraordinary liquidity injections in spring 2020 supplemented by extraordinary degrees of fiscal stimulus (and as a result dramatic increases in disposable personal income) and further increases in early 2021 due to additional fiscal stimulus. As the COVID-19 threat receded, this led to huge increases in spending and due to both the direct effects of COVID-19 and policy responses that discouraged work by providing more resources for not working than working (creating both wealth and price effects), shortages and supply chain disruptions. There is much to be learned from our experience in 2020 and 2021 about how to provide more consistent incentives in the face of an economy-wide emergency.
While it is clear historically that inflation rates have been highly persistent, the leadership at the Federal Reserve and Treasury insisted until Thanksgiving that last year’s inflation was transitory. Like many more prominent observers, I thought that the use of the “transitory” word was odd, especially when applied to such a persistent series as inflation. Furthermore, there is a simple potential interpretation of the persistence, namely the role of expectations in determining prices. Stepping back, I would say that we seem to know surprisingly little about inflation—reflecting that for about a decade before the pandemic the Federal Reserve could not generate as much inflation as it desired to keep the economy away from the possibility of deflation. For so many years that was the great inflation puzzle. In my 2020 RAPS paper I noted that the Fed struggled with its exit strategy from Quantitative Easing after the Financial Crisis, despite the absence of inflation—and wondered how it would exit from the COVID-19 liquidity expansion in 2020. This aspect continues to be an important part of the challenge, but now with the complication created by the presence of huge inflation. Perhaps the lesson from our inability to create more inflation in the many years when it was not present and our inability to readily snuff out extremely high levels of “transitory” inflation is our failure to appreciate the extent of its persistence and underlying that the importance of expectations in determining micro-economic price dynamics.