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SEE FAR

EXECUTIVE SUMMARIES

Washington University in St. Louis
Olin Business School

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Wells Fargo Advisors Center for
Finance and Accounting Research
Olin Business School
Washington University in St. Louis
MSC 1156-0133-04
One Brookings Drive
St. Louis, MO 63130-4899

Managing Editor
Kristen Jones

Design
Jenny Anderson Graphic Design

To obtain copies of the original research papers summarized here or to recommend your company for a future research project, please contact Kristen Jones, Wells Fargo Advisors Center for Finance and Accounting Operations Manager at kristen.jones@wustl.edu.

A Message from the Director

I am pleased to continue our magazine, *SEE FAR*. Apart from the obvious attempt to "capitalize" on the WFA-CFAR name, the name also captures the essence of our research: looking to the future rather than concentrating exclusively on current events and thinking, and focusing on big-picture issues that have far-reaching consequences.

All the articles in *SEE FAR* are based on finance and accounting research that has been previously published in an academic journal or as a monograph, or is currently a working paper that will be published in the future. The original papers have been rewritten as executive summaries for *SEE FAR* so that they are accessible to a broad audience, rather than solely to those in academia. While this is not an easy task, I believe that this will not only help us build a bridge between the research of Olin Business School faculty and those in the world of practice, but also will add to the knowledge people use on a daily basis. The intellectual capital generated by our faculty members' research is quite impressive – Olin consistently ranks among the top schools in terms of our research output. For this reason, it is important that WFA-CFAR research is made available to as many of our stakeholders as possible.

This publication serves as one way we support our mission to disseminate cutting-edge faculty research in accounting and finance. Another important way is through sponsoring academic conferences, and additionally by supporting accounting and finance research seminars. With the return to in-person events last year, we were happy to again be able to host our annual Olin Finance Conference at WashU on our St. Louis campus this past fall. We are also involved with several other research events such as the Wealth and Asset Management Conference (WAM) to be held at Olin Business School this spring. These conferences and seminars provide an opportunity to highlight not only research from our own faculty, but from leading scholars across the country and around the globe.

I hope that you enjoy reading the summaries in this issue. I would like to thank my faculty colleagues who participated in helping us create this issue by providing their papers and working with us to convert them into what you will read on the following pages. I look forward to any feedback you have to help us improve this magazine. Please contact WFA-CFAR Operations Manager Kristen Jones at **kristen.jones@wustl.edu** with your insights.

Sincerely yours,

Anjan Thakor
John E. Simon Professor of Finance, and Director of WFA Center for Finance and Accounting Research, Olin School of Business, Washington University in St. Louis

Journal: Working Paper

Paper: “Net-Zero Investing as a Response to Climate Crisis”

Authors: Marcin Kacperczyk

Net-Zero Investing as a Response to Climate Crisis

MARCIN KACPERCZYK, Imperial College London

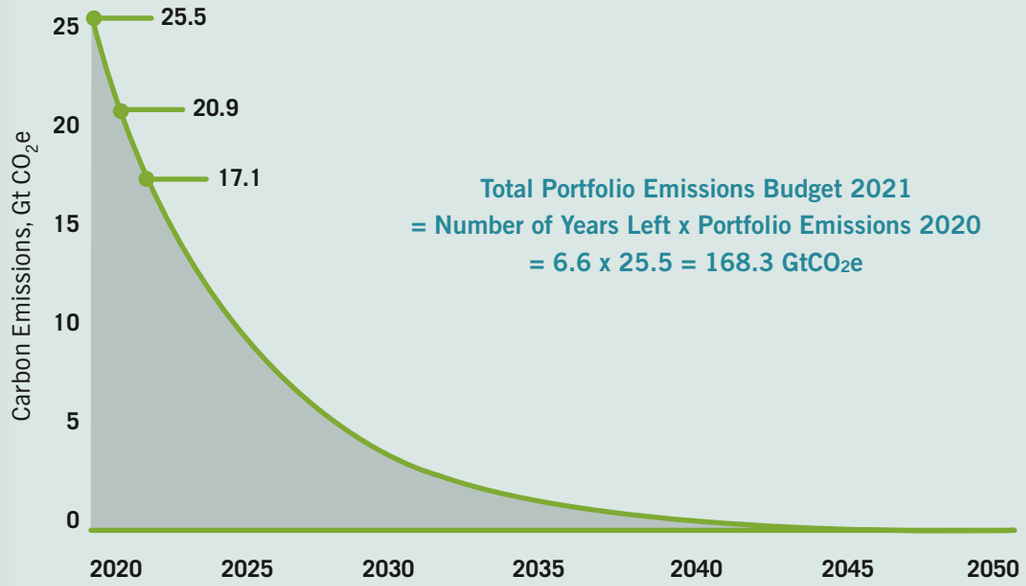
Addressing climate crisis is one of the most important social challenges of today. In the absence of a sufficiently well-coordinated global public response, the private sector has been considered an important pillar to put pressure on the polluting sector to reduce its emissions. The success of these efforts largely depends on the economic magnitude of the forces behind such pressure and their global reach. A recent initiative, net-zero investing, and its implementation through portfolio investing, holds significant promise in this regard.

Net-zero portfolios (NZP) aim to reduce their exposure to carbon-footprint companies over time, typically until 2050, by mimicking scientific paths of decarbonization for the global economy. Even though NZP by themselves do not guarantee the decarbonization of the global economy, they aim to provide incentives for the companies to do so. Companies that undertake emissions reduction are rewarded by being included in NZP, and companies that are behind the decarbonization curve are penalized by being excluded from NZP. The popularity of net-zero investing among institutional investors has been rapidly growing, with tens of trillion dollars of global assets under management currently covered by various net-zero investment initiatives.

How to Construct and Assess the Quality of Net-Zero Portfolios?

Important in the NZP concept are two elements: **(a) dynamic carbon budget,** applied by investors in their portfolio decisions, which is informed by scientific projections about climate scenarios, and determines the maximum amount of emissions NZP can be exposed to at each point in time, and **(b) the rule by which investors select companies into NZP.**

Figure 1. Portfolio Carbon Budget (2020)



Dynamic Carbon Budget

The starting point for constructing the portfolio budget is the global carbon budget. The global budget is defined as the amount of aggregate emissions that can be maximally produced to adhere to scientifically-determined climate scenarios informed by temperature changes. For illustration, I focus on one such scenario, in which the Intergovernmental Panel on Climate Change (IPCC), the leading provider of climate data, estimated that in order to limit the global temperature rise to below 1.5°C compared to pre-industrial levels, with 83% probability, one would need to limit global emissions to 300 GtCO2 as of the beginning of 2020. To get a better sense of this number the following thought exercise can be useful. The Global Carbon Project, a consortium of scientists, estimated that global emissions in 2020 reached 39.3 GtCO2; which means that the remaining budget as of beginning of 2021 was 260.7 GtCO2. Assuming a scenario in which emissions stayed constant into the near future, the remaining budget would be depleted within 6.6 years (260.7/39.3).

With the global carbon budget, one can construct the portfolio carbon budget using simple steps. First, the investable universe for investors needs to be defined. For that, I include stocks on all publicly traded firms for which we have emissions data. Second, emissions from direct and indirect sources (scope 1-3) are summed up from all such firms each year. This number equalled 25.5 GtCO2e in 2020. Third, assuming that the rate of portfolio decarbonization is proportional to the rate of global decarbonization, the cumulative portfolio budget is equal to the portfolio emissions in 2020 times the number of 6.6 years left to exhaust the world cumulative budget as of that date. This procedure yields an estimate of 168.3 GtCO2e.

Having pinned down the size of the total carbon budget for NZP, the next step is to decide the pathway along which investors would decarbonize their portfolios. This step is flexible and allows one to consider several different choices of such decarbonization paths, all created at the discretion of investors. To provide a visual illustration of the portfolio budget's construction, ***Figure 1*** zooms in on a pathway with constant-rate decarbonization for the cohort starting in 2020. From 2020, global emissions would need to drop to 32.2 GtCO2e, and, correspondingly, our net-zero portfolio would allow for a carbon footprint of 20.9 GtCO2e in 2021. Going forward, the carbon budget would continue its exponential decline until 2050 reaching the value close to 0. Given that the budget gets progressively tighter over time, it is with that spirit that investors would become more restrictive in holding assets with different carbon footprint.

NZP Selection Rule

As a second step to obtaining NZP, one has to decide on the rule by which investors select companies into NZP, such that their total emissions jointly do not exceed the yearly emissions budget. A broad principle being applied is that companies with greater decarbonization prospects should be given preference. On Page 9, I select companies according to their combined efforts to decarbonize their activities, measured by a novel composite, *The Ambition Score*, introduced in Cenedese, Han, and Kacperczyk (2023).

The measure captures both corporate intention and ability to decarbonize their future activities. The basic idea is to integrate information from past decarbonization efforts with information that speaks to future efforts to do so. *The Ambition Score* is defined as a weighted average of the following three categories of variables: **(1) historical emissions levels and their growth rates (50%), (2) historical emissions intensities and their growth rates (25%), and, (3) forward-looking climate-related activity metrics (25%).** Within each category, equal weights are assigned to individual characteristics. The weighting scheme to construct the score can be modified in a very flexible way. All three categories aim to predict firm-level decarbonization outcomes.

Specifically, within the first category, the size and the three-year moving-average simple growth rate of the company's absolute carbon emissions are included. Within the second category, the level and the three-year moving-average growth rate of the companies' carbon intensities, measured as tons of CO2 equivalent divided by the company's revenue in millions of dollars, are included. Within the third category, three aspects of decarbonization ambition measures are incorporated: **(a) environmental variables from the company's Corporate**

Table 1. Ambition Score for Apple (2020)

Category	Category Weight	Data Source	Variables	Reported Value	Score Input	Standardized Value
Historical hard data	50%	Trucost	Carbon emission	39,453,087.42	39,453,087.42	165.24
			Emission growth	0.14	0.14	0.68
Historical soft data	25%		Carbon intensity	143.72	143.72	-0.56
			Intensity Growth	0.06	0.06	1.65
Forward-looking soft data	25%	CSR Report	Decarbonization target existence	Yes	0	-2.59
			Decarbonization policy existence	Yes	0	-1.75
			Emission disclosure	Reported	0	-1.94
			Sustainability committee existence	Yes	0	-2.08
			UNPRI signatory	No	1	NA
			SDG13 climate action	Yes	0	-2.63
		Orbis Patent	Green patent number	24	-24	-2.34
			Brown efficiency patent number	0	0	0.14
			Green patent citation number	264	-264	-16.1
			Brown efficiency patent citation number	0	0	0.11
			Green patent ratio	0.03	-0.03	0
			Brown efficiency patent ratio	0	0	0.08
		CDP Survey	SBTi participation	Submitted	1	-2.8
			Greenwashing indicator	0	0	3.18
			Abatement rate	5	-5	-6.35
			Target underperformance	18.96	18.96	-3.83
			Target impracticability	18.00	18.00	-3.78
					Final Score	40.93

Social Responsibility (CSR) report, (b) patent variables on green and brown innovations, and, (c) variables on decarbonization commitments reported in the CDP survey. *Table 1,* above, presents details for how this information gets aggregated into *The Ambition Score* using the example of Apple in 2020.

Properties of NZP

Some of the typical concerns of the net-zero-portfolios concern their properties relative to benchmark portfolios. It turns out that such portfolios display characteristics that are favorable. First, in ***Figure 2,*** I show the evolution of the ex-ante tracking error of the portfolio with constant decarbonization rate relative to MSCI Europe Index.

The net-zero portfolio has tracking error that is quite small and ranges between 0.08% in 2021 and 1.9% in 2050. This result indicates that portfolio decarbonization is feasible without losing diversification benefits. As another dimension, I show the

Figure 2. Ex-Ante Tracking Error for NZP Based on MSCI Europe Index

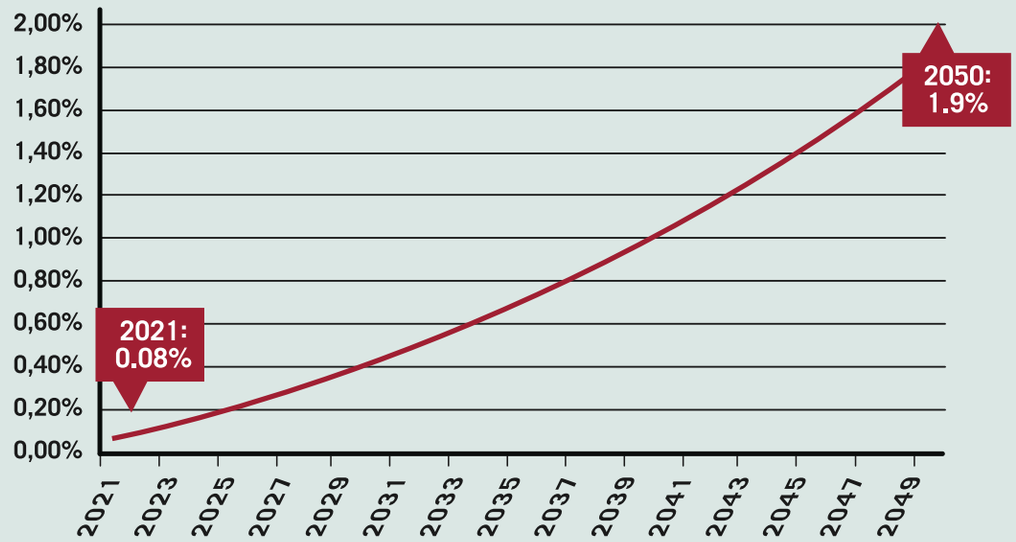
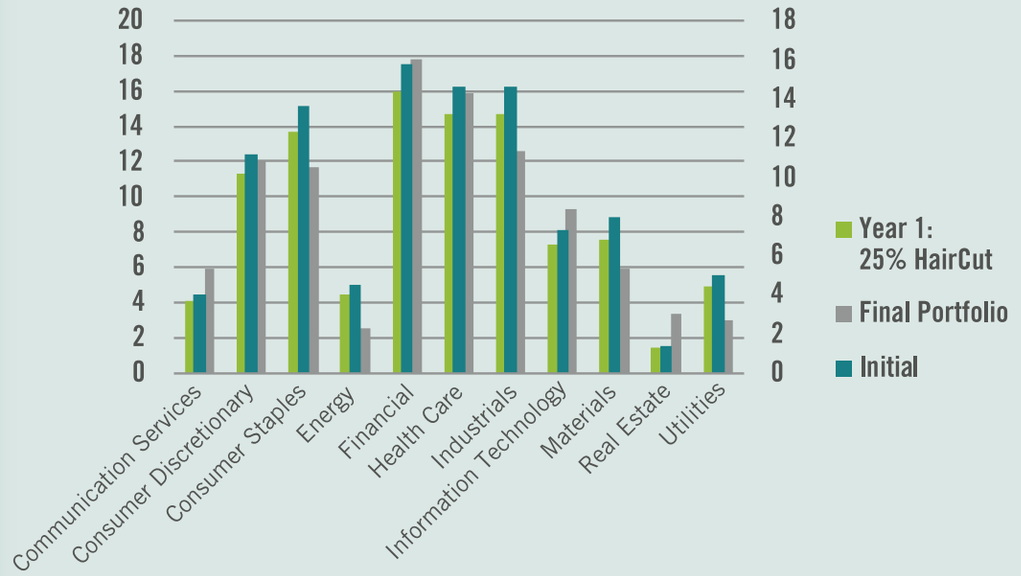


Figure 3. NZ Portfolio Sector Deviations (2020)



sectoral distribution of assets relative to the same MSCI Europe benchmark. The results presented in ***Figure 3,*** above, indicate that the NZP does not create a strong tilt away from any individual industries and instead is well balanced across sectors.

Overall, it becomes apparent that the NZP framework can offer a well-diversified portfolio that reduces exposure to the global carbon footprint.

“Net-zero portfolios rely on the interaction of two elements: a carbon budget that is informed by scientific projections and the discretionary rule of investors in selecting companies into portfolios.”

Do NZP Influence Asset Values?

A notable feature of the NZP framework is its applicability to measures of carbon-transition risk. As the carbon budget gets progressively tighter, companies are more likely to exit NZP unless they change their own decarbonization efforts, in both absolute and relative terms. Companies for which the exclusion threat is greater face more pressure. In Cenedese et al. (2023), we measure such exposures using the distance in years until the expected exclusion from the NZP takes place and define them as distance-to-exit (DTE). DTE are forward-looking measures of carbon-transition risk implied by investor preferences, and thus investors should require compensation for bearing such risk.

There are at least three direct channels through which the pricing effect can operate. First, divestment by a significant fraction of investors can reduce risk sharing, and thus affect equilibrium prices and returns. Second, the pricing effect can be induced by investors’ expectations of future divestment, which could be nontrivial even if one does not observe significant portfolio movements today. Finally, through net-zero portfolios, investors can communicate expectations of future divestment to corporates, and thus exert pressure on corporates to adjust their efforts to avoid potential penalties. This last communication channel suggests a new insight, namely, NZP can be used for both divestment and engagement.

In Cenedese et al. (2023), we study whether companies with different DTE differ in terms of their cost of equity. To this end, we first relate DTE to next month’s stock returns. Across all specifications, we find a statistically strong negative association between DTE and stock returns. The results are economically large: a one-standard-deviation increase in DTE for a given cross-section of firms is associated with an approximate 2.5-4.6 percentage-point reduction in next month’s annualized stock returns. These results support the hypothesis that companies with lower DTE are more risky and investors require higher compensation for holding their shares.

We also provide additional evidence using valuation regressions. The benefit of using this approach is that valuation ratios are less noisy than stock returns. Further, they can control for future cash flows, and thus the interpretation of our results is more aligned with the pure discount rate effect. We find a strong positive correlation between DTE and various measures of valuation ratios. These results are consistent with the view that companies subject to stronger NZP pressure are priced with lower multiples than those for which the pressure is weaker.

The above findings strongly support the risk-based explanation of the cross-sectional variation in stock returns. Given the nature of exit measures, the most natural interpretation is that of transition risk. This interpretation is further supported by a test in which the size of the exit premium is related to a shift in transition risk due to Paris Agreement. In fact, the cross-sectional premium in stock returns roughly doubles when risk premia are measured using either stock returns or price-to-earnings ratios.

Conclusion

The concept of net-zero investing has been gaining popularity among institutional investors. Net-zero portfolios rely on the interaction of two elements: a carbon budget that is informed by scientific projections and the discretionary rule of investors in selecting companies into portfolios. An important element of the NZP framework is its flexibility that allows the decision makers to change their inputs according to their forecasts of climate effects. I show that net-zero portfolios maintain a healthy balance between portfolio diversification, manifested by the inclusion of representative sectors and risks, and resulting decarbonization of the portfolio. They also have reasonable tracking errors, not exceeding 2%. The framework can be applied to construct measures of carbon-transition risk implied by investors’ preferences. The measure of risk, distance-to-exit, is significantly related to cross-sectional variation in stock returns and their valuation ratios. The variation in pricing is consistent with investors’ revision of beliefs regarding climate change and is robust across different decarbonization choices.

Overall, the NZP framework can be a useful tool in the process of exerting pressure on the corporate sector to decarbonize its activities. With the increasing pressure to address climate change, more institutional capital is expected to move in a direction consistent with this principle. While the NZP framework has considerable appeal, it also has some limitations. The decarbonization of the portfolio need not automatically imply decarbonization of the polluting sector. NZP is just a framework through which some cost can be imposed to encourage change, but optimizing companies would still take into consideration other costs and benefits when deciding on their investment decisions. Obviously, the higher the cost being imposed by NZP, the greater the likelihood one would assign to real change, similar to standard tax logic. But NZP is not designed to provide a calculation of the net social benefit of achieving climate change targets. Rather, it is aimed at providing a mechanism to achieve the desired targets. Finally, from a broader perspective, NZP should be treated as one of the elements with which the pressure could be applied, and it is through the combination of many similar forces that better outcomes can be achieved.

References

Cenedese, Gino, Shangqi Han, and Marcin Kacperczyk, 2023, “Carbon-Transition Risk and Net-Zero Portfolios,” *Working Paper, Imperial College London.*

Journal: Working Paper

Paper: "Which Have Been the Most Research-Productive Finance Departments in the Past Twenty Years?"

Authors: Yakshup Chopra, Mark Leary, Tatiana Vdovina

Which Have Been the Most Research-Productive Finance Departments in the Past Twenty Years?

MARK LEARY, Olin Business School, Washington University in St. Louis
TATIANA VDOVINA, Olin Business School, Washington University in St. Louis

In this paper, we provide a global ranking of finance departments in business schools for the past 20 years and the past decade. The ranking is the first of its kind in many respects - it includes publications in the top six finance journals (by 2022 impact factor) as well as a host of top journals in Economics and Accounting, and provides a per-capita sort, where we compute the ratio of total publications to the number of finance faculty in the department. The rankings, available on the website of the Wells Fargo Advisors Center for Finance and Accounting Research, use a manipulable database that allows the user to change the time-period, chosen journals and whether to sort rankings on per-capita or gross publication output.

Why do we need better finance department rankings? There are many groups interested in knowing how productive Finance departments have been in publishing in Finance and Economics journals. Graduating Ph.D. students trying to decide which schools to apply to for faculty positions, students trying to decide which Ph.D. programs to apply to, and deans of business schools attempting to evaluate their Finance departments, are all potential users of this information.

A number of papers have provided Finance research rankings of various sorts[1] and both Arizona State University (ASU) and the University of Texas-Dallas (UT-Dallas) publish rankings websites. While these existing rankings are useful, they are either very broad (e.g. rankings of business schools as opposed to finance departments as with the UT-Dallas ranking or the *Financial Times* ranking) or focus on a narrower set of journals than the set that many schools use to evaluate faculty as well as departments (e.g. focusing on only a few finance journals.)[2] Many influential Finance papers have been published in Economics journals like *The American Economic Review, The Quarterly*

Journal of Economics, The Review of Economic Studies, Econometrica, and *The Journal of Political Economy.* When Finance faculty are evaluated for promotion and tenure, these publications matter a lot. Thus, there is a need for a ranking of Finance departments based on a more comprehensive set of Finance and Economics journals than any ranking available at present.

The WFA Center for Finance and Accounting Research (CFAR, henceforth) at the Olin Business School at Washington University in St. Louis has created a new rankings website to meet this need. The website ranks 141 Finance departments all over the world based on the publications of their Finance faculty in 21 journals: Six top Finance journals, ten Economics journals, three Accounting journals, and two general interest journals. The journals are selected on the objective criterion of the two-year SSCI impact factor that most journals post on their websites. The Finance and Accounting journals chosen are the top journals in these fields based on impact factor. An exception to this is the set of journals in Economics, where we select the top five journals plus a few others based on the preponderance of finance publications there, rather than just the impact factor. So, for example, *The Journal of Economic Theory* would not make it on the list based solely on its impact factor, but over the years, it has published numerous influential Finance papers.

The rankings website (the link to website is: https://cfar-ranking.olin.wustl.edu/) has a number of features that are unavailable elsewhere:

- **One can get the rankings for any chosen time-period; the default ranking is for the period 2000-2023.**
- **One can get either a per-capita ranking (which divides the total research output of the department by the number of tenured and tenure-track Finance faculty) or a gross ranking that does not adjust for faculty size.**
- **One can choose the journals included in the rankings, i.e., you can select any subset of the journals included. The default ranking includes all of them.**

We will update the rankings every year as new data arrive, and our plan going forward is to publish a rolling (fixed duration) ranking every year. This paper provides rankings for the past decade and the past 20 years.

Rankings Methodology

Broadly, our methodology includes three steps: journal data collection, faculty data collection, and cleaning and merging the two datasets. We collect the journal data from two academic journal data sources: *EconLit* and *Business Source Complete* (BSC, henceforth). ***Table 1*** provides the list of all the journals that we cover in the rankings. We pull the article title, authors, affiliations, source, journal title, edition, and date from both data sources.

In our second step, we manually collect the names of every faculty listed on the business school's webpage at the onset of each academic year. We do not include emerita faculty, visiting professors, lecturers, and clinical professors in our faculty list. We then compute the total faculty count to compute the per-capita figure. This step is important, as the authors' affiliations in the paper do not indicate if they are full-time. As we began the project at the beginning of 2016, we assumed the faculty count for academic years before 2016 to be constant.

After cleaning the data, we merge the two datasets to match the articles to each school. This produces a list of journal articles that are published by finance faculty for a given institution in a given year. The above procedure is repeated yearly for the entire sample.

A few points about our methodology are worth noting. First, for publications in non-finance journals, our inclusion criterion was that at least one of the co-authors was a member of that school's Finance department. We did not use our judgment to determine if the paper addresses a topic in finance per se, since that would introduce unnecessary subjectivity in the selection. Moreover, such labels are extremely difficult anyway since the dividing boundaries between Finance, Economics, and Accounting are very fluid and hazy. Second, we recognize that some Economics departments also have Finance faculty (e.g.: Harvard University Economics and Princeton University Economics).

Table 1: List of Journals in the Rankings

	JOURNAL	Impact Factor (2022 or Latest Available)
FINANCE	Journal of Finance	7.87
	Journal of Financial Economics	8.24
	Review of Financial Studies	8.41
	Journal of Financial Intermediation	5.98
	Review of Finance	5.06
	Journal of Financial and Quantitative Analysis	4.33
ECONOMICS	Quarterly Journal of Economics	19.01
	American Economic Review	10.54
	Journal of Political Economy	9.64
	Review of Economic Studies	7.83
	Econometrica	6.38
	Journal of Monetary Economics	4.63
	The Economic Journal	3.72
	RAND Journal of Economics	2.25
	Journal of Money, Credit & Banking	1.96
	Journal of Economic Theory	1.79
ACCOUNTING	Journal of Accounting & Economics	7.29
	Journal of Accounting Research	4.45
	The Accounting Review	4.99
GENERAL BUSINESS	Management Science	6.17
	Journal of Business	4.80

So, we include those faculty as well if they have published at least three papers in the top three Finance journals (*Journal of Finance, Journal of Financial Economics,* and *The Review of Financial Studies*). Third, if a faculty member moves from School A to School in B in 2015 (say), all of that faculty's publications up to and including 2015 are credited to School A for each of the years the person was at School A, and publications after 2015 are credited to School B. Fourth, as ***Table 1*** makes clear, in Finance and Accounting, we have chosen the top journals based on the 2022 (or latest) two-year impact factors. Finally, users can click on the yearly count of any school to see which publications of its faculty were included for any given year. This information is shown on the website below the rankings table and details the journal, article name, and all the authors.

We find that coverage in the two databases misses some of the recent articles or is thinly populated for some journals in recent years. We tried to include many of those missing data points. If a user does not find her paper or finds an error in reported data, the website provides a mechanism to report and communicate that information to us.

The Rankings

Table 2 (Page 17) provides a ranking of the top 50 finance departments over the past 20 years, 2003-2022. Years are defined as calendar years, from January 1 to December 31. The data for

[1] See, for example, Klemkosky and Tuttle (1977); Borokhovich, Bricker, Brunarski, and Simkins (1995); Chan, Chen, and Steiner (2002); Kim, Morse, and Zingales (2009); Korkeam¨aki, Sihvonen, and V¨ah¨aamaa (2018); Garfinkel, Hammoudeh, and Weston (2021).

[2] For example, the ASU ranking uses only four Finance journals: *Journal of Finance, Journal of Financial Economics, Review of Financial Studies* and *Journal of Financial and Quantitative Analysis.*

Table 2: Top Finance Research Producers (2003-2022)

RANK	UNIVERSITY	PER-CAPITA SCORE
	TOP 25	
1	University of California, Berkeley	0.8157
2	University of Chicago	0.7468
3	MIT	0.6421
4	Harvard University	0.6394
5	Yale University	0.6114
6	University of California, Los Angeles	0.5996
7	Duke University	0.5556
8	Brown University	0.5250
9	University of Michigan, Ann Arbor	0.4892
10	Ohio State University, Columbus	0.4858
11	Washington University in St. Louis	0.4780
12	University of Geneva	0.4758
13 (tie)	California Institute of Technology	0.4708
13 (tie)	Cornell University	0.4708
14	Stanford University	0.4704
15	New York University	0.4695
16	University of Lausanne	0.4619
17	London Business School	0.4383
18	Northwestern University	0.4318
19	Hong Kong University	0.4308
20	Wharton School of the University of Pennsylvania	0.4295
21	Columbia University	0.4280
22	Dartmouth College	0.4105
23	Princeton University	0.3994
24	University of Texas at Austin	0.3949
25	Rice University	0.3936
	NEXT 25	
26	Boston College	0.3930
27	University of Minnesota	0.3873
28	University of British Columbia	0.3784
29	University of California, San Diego	0.3629
30	London School of Economics	0.3587
31	University of North Carolina	0.3584
32	HEC Paris	0.3446
33	University of Illinois at Urbana-Champaign	0.3411
34	University of Oxford	0.3409
35	University of Arizona	0.3370
36	University of Washington, Seattle	0.3339
37	Purdue University	0.3331
38	INSEAD	0.3310
39	Indiana University	0.3297
40	University of California, Irvine	0.3252
41	Georgia State University	0.3242
42	University of Rochester	0.3103
43	Carnegie Mellon University	0.3099
44	University of Maryland	0.2998
45	McGill University	0.2979
46	University of Virginia	0.2977
47	Emory University	0.2903
48	Tilburg University	0.2850
49	University of California, Davis	0.2844
50	University of Southern California	0.2843

Table 3: Top Finance Research Producers (2013-2022)

RANK	UNIVERSITY	PER-CAPITA SCORE
	TOP 25	
1	University of California, Berkeley	0.9314
2	University of Chicago	0.7852
3	MIT	0.7526
4	University of Geneva	0.7515
5	Hong Kong University	0.6685
6	Yale University	0.6415
7	Harvard University	0.5968
8	California Institute of Technology	0.5667
9	Stanford University	0.5357
10	University of California, Los Angeles	0.5343
11	Cornell University	0.5321
12	Washington University in St. Louis	0.5227
13	Duke University	0.5195
14	University of Lausanne	0.5055
15	Ohio State University, Columbus	0.5008
16	HEC Paris	0.4892
17	Dartmouth College	0.4876
18	University of Minnesota	0.4851
19	Columbia University	0.4838
20	Boston College	0.4707
21	Princeton University	0.4617
22	Tsinghua University	0.4519
23	London Business School	0.4411
24	Northwestern University	0.4378
25	New York University	0.4372
	NEXT 25	
26	University of Washington, Seattle	0.4279
27	University of Oxford	0.4262
28	University of California, San Diego	0.4258
29	Wharton School of the University of Pennsylvania	0.4200
30	National University of Singapore	0.4112
31	Rice University	0.4053
32	University of Michigan, Ann Arbor	0.4033
33	Indiana University	0.4016
34	University of British Columbia	0.4012
35	University of North Carolina	0.3989
36	London School of Economics	0.3988
37	Georgia State University	0.3983
38	University of Texas at Austin	0.3932
39	Tel Aviv University	0.3886
40	University of Illinois at Urbana-Champaign	0.3856
41	University of California, Irvine	0.3595
42	University of Southern California	0.3456
43	University of New South Wales	0.3449
44	University of Arizona	0.3408
45	INSEAD	0.3385
46	Purdue University	0.3304
47	Carnegie Mellon University	0.3275
48	Georgetown University	0.3139
49	University of Toronto	0.3126
50	McGill University	0.3092

2023, which is available on the rankings website, includes data up to April or May 2023, when available in the databases. Column one reports the rank, sorted using per-capita score. Column two reports the name of the University/School. Column three reports the per-capita publication score, based on the full set of journals.

There is some volatility in these rankings over time. ***Table 3*** (Page 18) presents the top 50 schools over the past decade, 2013-2022. As is evident, there is movement in the rankings, although the top three ranked departments (University of California, Berkeley, University of Chicago, and MIT) remain consistent.

As these tables make clear, the per-capita nature of the rankings does make a difference, as it does not "discriminate" against smaller departments. For example, the University of Geneva has a rather small, but quite productive, faculty group. This university would fall outside of the top 50 based on total publications but rank #4 on a per capita basis over the past decade. Also of note, Washington University in St. Louis ranks #18 based on total publications and #12 on a per-capita basis over the past decade.

The information provided in these tables also sheds light on the average publications productivity of faculty at the top schools, and its cross-sectional variance. For example, over the past two decades (2003-2022), there is significant dispersion in the average publications per faculty across even the top 25 schools, ranging from 0.394 (Rice University ranked #25) to 0.816 (University of California, Berkeley ranked #1).

Conclusion

This paper provides global rankings of the top 50 finance departments based on research productivity over the past 20 years and over the past decade. There are many familiar names ranked where people would expect them, and perhaps others that will surprise some. The rankings website includes 141 schools from all over the world, not just the top 50. We hope that this information is useful to many users.

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Journal: *Review of Finance,* forthcoming

Paper: "Income, Liquidity, and the Consumption Response to the 2020 Economic Stimulus Payments"

Authors: Scott Baker, Robert Farrokhnia, Steffen Meyer, Michaela Pagel, Constantine Yannelis

Income, Liquidity, and the Consumption Response to the 2020 Economic Stimulus Payments

MICHAELA PAGEL, Olin Business School, Washington University in St. Louis

In response to the COVID-19 pandemic, the US government directed large cash payments to households starting in April 2020. In this study, we analyze households' spending responses using data from a Fintech non-profit, exploring heterogeneity by income, recent income declines, and liquidity, as well as linked survey responses about economic expectations.

We find that households responded rapidly to payments, with spending increasing by about $0.14 per dollar during the first week and plateauing around $0.25-$0.30 over three months. In contrast to previous stimulus programs, we see little response of durables spending. Households with lower incomes, greater income declines, and less liquidity displayed stronger responses whereas households that expect employment losses and benefit cuts displayed weaker responses.

Motivation

In three recent instances, the U.S. government made direct cash payments to households in response to economic downturns. These payments are generally meant to alleviate the effects of a recession and stimulate the economy through a so-called multiplier effect. The idea is to provide households with additional money to spend during tough economic times when they would be inclined to cut back on spending. In turn, at the level of the overall economy, the increased spending translates into more income, production, and employment. The onset of the COVID-19 pandemic brought about a massive worldwide economic shock, prompting many national governments to turn to direct stimulus payments to both bolster the economy as well as provide immediate liquidity to households affected by the crisis. While the unprecedented and multifaceted nature of the COVID shock makes extrapolation to all household stimulus programs more difficult, this paper provides estimates that are, at the very least, important for understanding responses to this singular shock.

The impact of household stimulus payments on the broader economy relies on households' marginal propensities to consume, or MPCs. Because some households are more responsive to stimulus payments, targeting can have large effects on the effectiveness of stimulus payments on aggregate

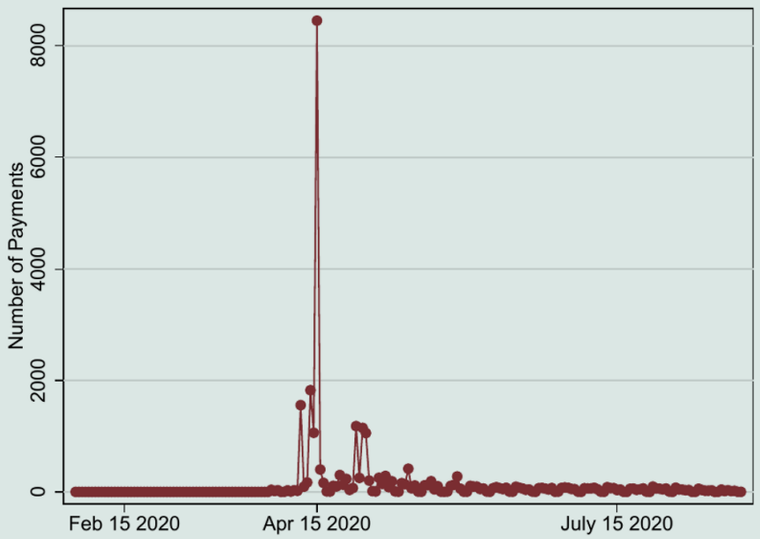

Figure 1: Daily Number of Government Payments at Stimulus Account

This figure shows the number of payments users receive that match the amounts of the 2020 government stimulus payment by day from February 2020 onwards. Potential payments are classified by the specific amounts of the stimulus checks and need to appear as being tax refunds, credit or direct deposits. Source: *SaverLife*.

consumption throughout the economy. Additionally, heterogeneity in MPCs helps distinguish between different models of household consumption behavior at play in this unique period.

Data and Analysis

In this paper, we estimate households' MPCs in response to the 2020 CARES Act stimulus payments distributed in April and May 2020 by using high-frequency transaction data from *SaverLife*, a non-profit financial technology firm. As opposed to many other Fintech firms, individuals in our sample consists primarily of lower- and middle-income households. For these users, we have access to de-identified bank account transactions and balances data from August 2016 to August 2020.

All adults with social security numbers who filed their tax returns and earned below certain income thresholds qualified for the direct payments. Payments began phasing out at $75,000 per individual, $112,500 for heads of households (single parents with children), and $150,000 for married couples. No payments were made to individuals earning more than $99,000 or married couples earning more than $198,000.

Payments were made by direct deposit whenever available, or by paper check when direct deposit information was unavailable. Funds were disbursed by the IRS, and the first payments by direct deposit were made on April 9th. The IRS expected that direct deposits would largely be completed by April 15th. In practice, the timing varied across banks and financial institutions, with some making payments available earlier than others, and direct deposits being spread out across more than one week. Amounts and accounts for direct deposits were determined using 2019 tax returns, or 2018 tax returns if the former were unavailable. Approximately 70-80% of taxpayers used direct deposit to receive their tax refunds. For individuals without direct deposit information, paper checks were scheduled to be mailed starting on April 24th.

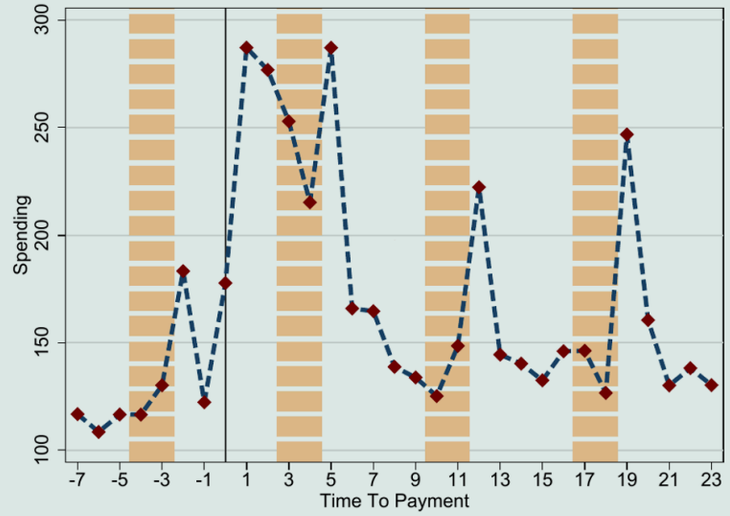

Figure 2: Mean Spending Around Receiving the Stimulus Payments – Raw Spending

This figure shows mean spending around the receipt of stimulus payments. The sample includes only users who receive a stimulus payment during our sample period. The vertical axis measures spending in dollars, and the horizontal axis shows time in days from receiving the stimulus check which is defined as zero (0). Shaded days represent weekends for the majority of the stimulus recipients who receive their payment on Wednesday, April 15th. Source: *SaverLife*.

We identify stimulus payments using payment amounts stipulated by the CARES Act, identifying all payments at the specific amounts (e.g. $1,200, $1,700, $2,400) paid after April 9th in the categories "Refund," "Deposit," "Government Income," and "Credit." ***Figure 1*** shows the identified number of payments of this type, relaxing the time restrictions in 2020. While there are a small number of payments in these categories at the exact stimulus amounts prior to the beginning of payments, there is a clear increase in frequency after April 9th.

Looking at the raw levels of spending for users receiving stimulus payments, ***Figure 2*** shows mean daily spending before and after the receipt of a stimulus payment without any other controls or comparison group. In this figure, we only show spending data for users who receive a stimulus check in our sample period. Prior to receiving a check, the typical individual in the sample who receives a stimulus check is spending around $90 per day. Mean daily spending rises to about $250 for the days after the receipt of the stimulus payment.

There is a sharp and immediate increase in spending following the receipt of a stimulus deposit; users show large increases in spending in the first days following the stimulus check receipt and keep spending significantly more than those who have not received checks.

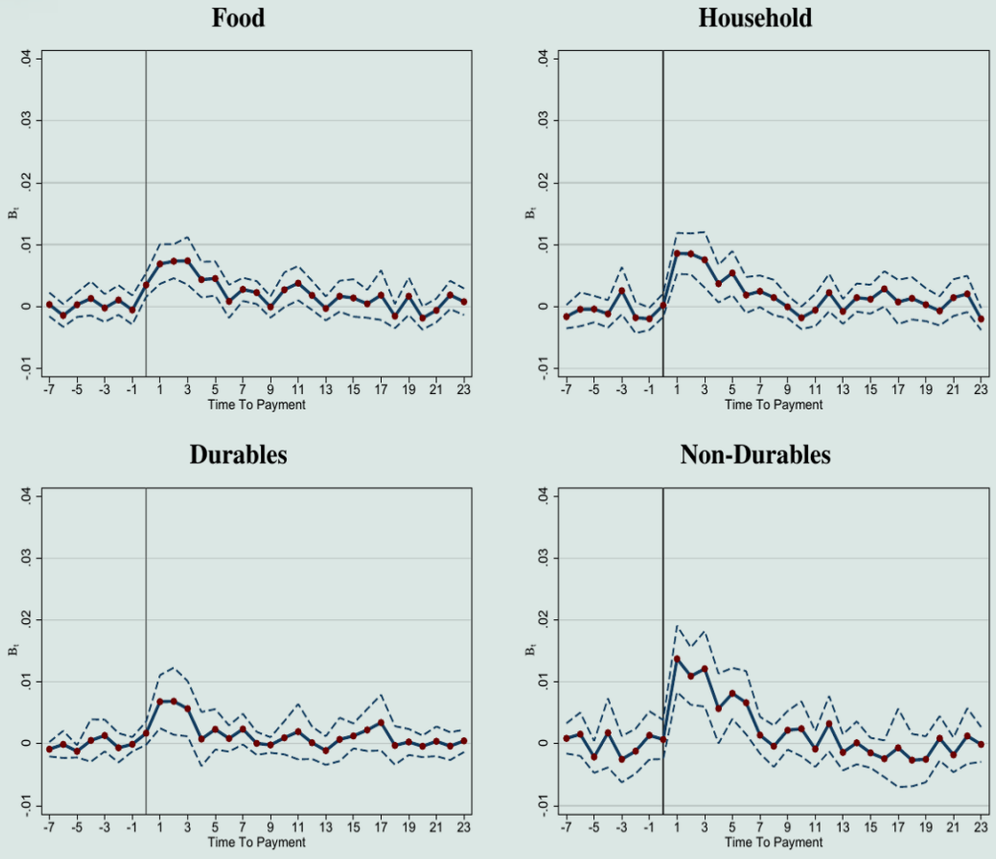

Figure 3: Spending Around Stimulus Payments by Categories

This figure shows the estimate of β_k from $c_{it} = \alpha_i + \alpha_t + \sum_{k=-7}^{23} \beta_k \mathbb{1}[t = k]_{it} + \varepsilon_{it}$ broken down by spending categories. The solid line shows point estimates of β_k, while the dashed lines show the 95% confidence interval. Standard errors are clustered at the user level. Time to payment is equal to zero on the day of receiving the stimulus check. Source: *SaverLife*.

In *Figure 3*, we break down users' spending responses by categories of spending. We map our categories to roughly correspond to those reported in the Consumer Expenditure Survey: food, household goods and personal care, durables like auto-related spending, furniture, and electronics, non-durables and services. Across all categories, we find statistically significant increases in spending following the receipt of a stimulus check. These responses are widely distributed across categories, with cumulative spending on food, household, non-durables, and durables all seeing increases in spending in the first week following. These effects are concentrated in the near term, with excess spending declining substantially following the first week.

In *Figure 4*, we look at the impact of the stimulus check on financial payments and transfers. In particular, we examine the impact on total transfers out of an

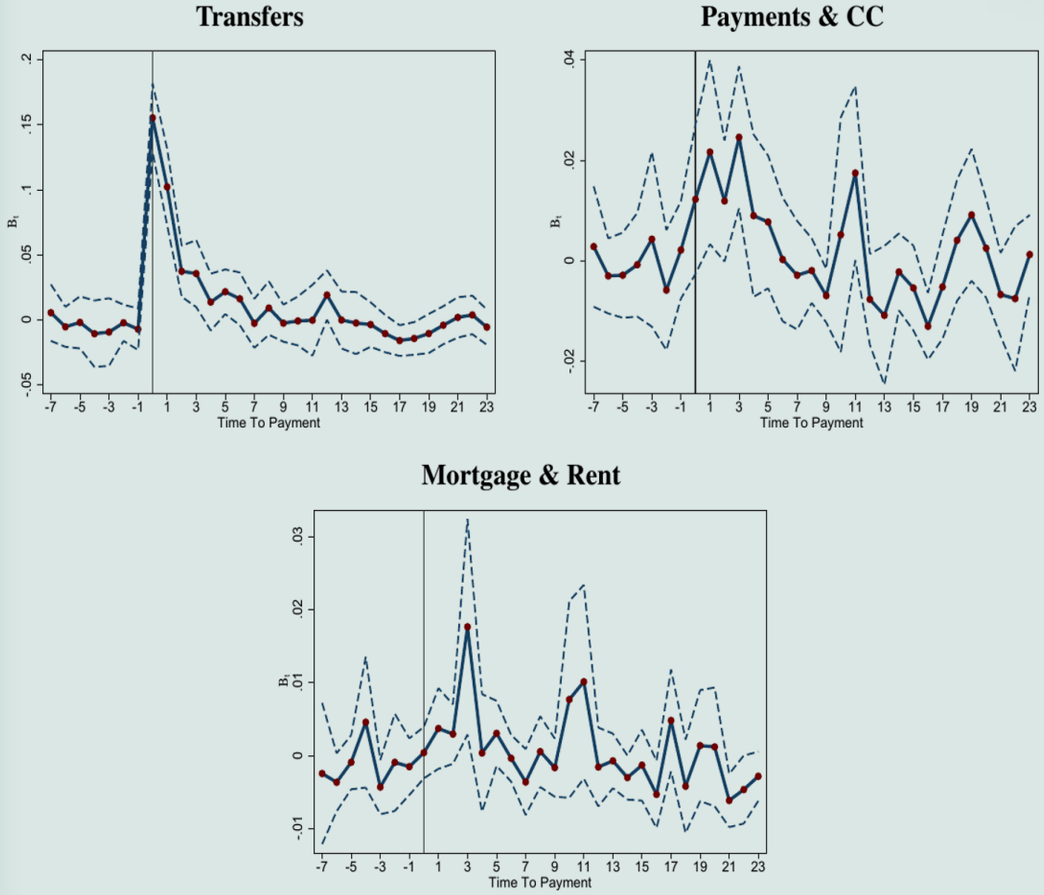

Figure 4: Payments and Transfers Around Stimulus

This figure shows the estimate of β_k from $c_{it} = \alpha_i + \alpha_t + \sum_{k=-7}^{23} \beta_k \mathbb{1}[t = k]_{it} + \varepsilon_{it}$ broken down by payment categories. The solid line shows point estimates of β_k, while the dashed lines show the 95% confidence interval. Standard errors are clustered at the user level. Date and individual times day of week fixed effects are included. Time to payment is equal to zero on the day of receiving the stimulus check. Source: *SaverLife*.

individual's checking account, financial payments and credit card payments, and rent and mortgage payments. Most of the transfers, in the top left panel, are likely transfers to things like savings and brokerage accounts, but some may represent loan payments or transfers to external vendors, as well.

As with other categories of spending, we find that financial payments and transfers surge substantially upon receipt of the stimulus payments. Households increase their paying down of credit cards and also increase payments on mortgages, rent, and other loan products.

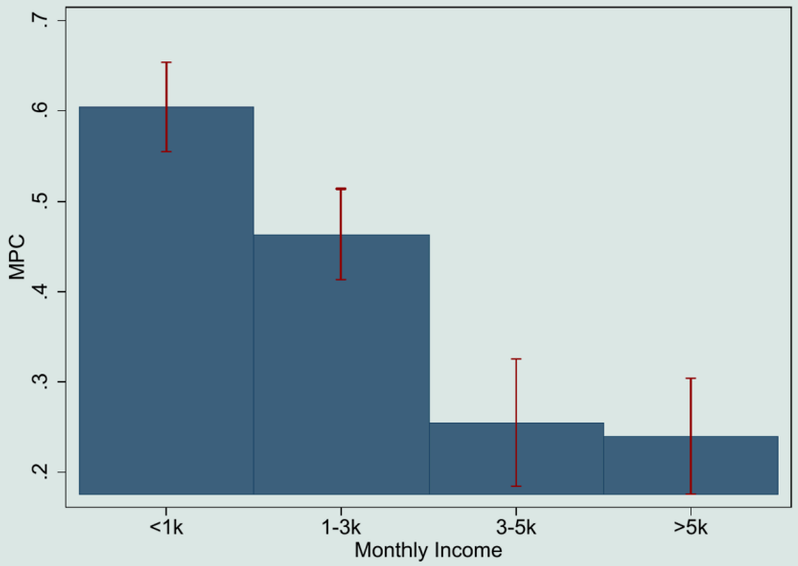

Figure 5: MPC by Income Groups

This figure shows cumulative 3-month MPCs estimated from coefficients from regressions of spending on an indicator of a time period being after a stimulus payment, scaled by the amount of the payment over the number of days since the payment. These coefficients correspond to ζ from $c_{it} = \alpha_i + \alpha_t + \zeta \frac{Post_{it} \times P_i}{D_{it}} + \varepsilon_{it}$ (cumulative fraction of the stimulus check that has been spent), broken down by monthly income groups. Date and individual fixed effects are included. The bars show point estimates, while the thin lines show the 95% confidence interval. Source: *SaverLife*.

Figure 5 splits users by their average income in January and February 2020 (prior to the major impacts of the pandemic). We see clear evidence that users with lower levels of income tended to respond much more strongly to the receipt of a stimulus payment than those with higher levels of income. Users who had earned under $1,000 per month saw an MPC about twice as large as users who earned $5,000 a month or more.

We also split our sample of users according to their accounts' balances at the beginning of April, before any stimulus payments were made. We separate users into groups according to account balances, from under $100 to over $1,000. *Figure 6* displays dramatic differences across these groups of users. Users with the highest balances in their bank accounts had 3-month MPCs on the order of 0.15 while those who had under $100 had MPCs of above 0.5.

We further explore how beliefs about personal and aggregate outcomes impact the response to stimulus payments, utilizing a survey of our users which we can then link to the transaction data. In our survey, users are asked about their expectations regarding unemployment, salary cuts, tax increases, benefit cuts, stock market performance, and the duration of the pandemic. We received 1,011 unique responses and find that our users are relatively pessimistic about the length of the pandemic and their own future income and employment opportunities. While we do not find evidence that anticipated tax increases impact MPCs, we do find that households who anticipate unemployment or benefit

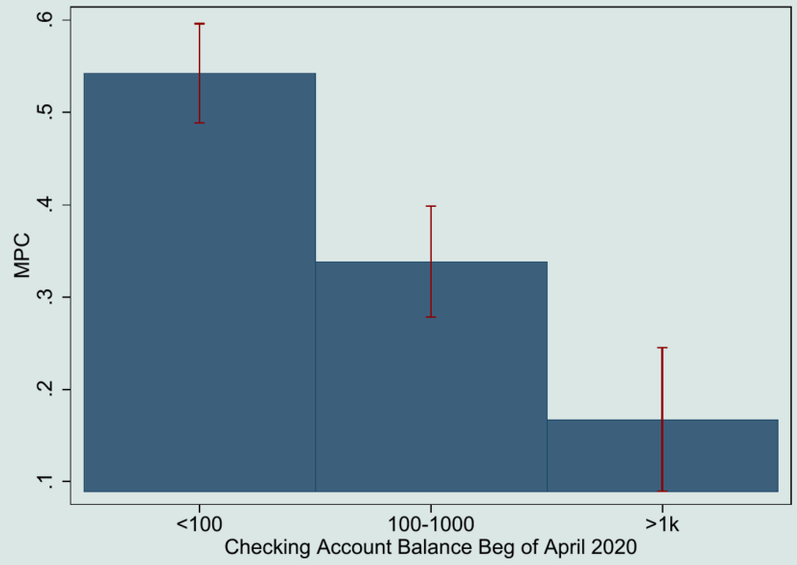

Figure 6: MPC by Liquidity

This figure shows cumulative 3-month MPCs estimated from coefficients from regressions of spending on an indicator of a time period being after a stimulus payment, scaled by the amount of the payment over the number of days since the payment. These coefficients correspond to ζ from $c_{it} = \alpha_i + \alpha_t + \zeta \frac{Post_{it} \times P_i}{D_{it}} + \varepsilon_{it}$ (cumulative fraction of the stimulus check that has been spent), broken down by account balances. Date and individual fixed effects are included. The bars show point estimates, while the thin lines show the 95% confidence interval. Source: *SaverLife*.

cuts save a significantly larger fraction of their stimulus checks.

Conclusion

This paper studies the impact of the 2020 CARES Act stimulus payments on household spending using detailed high-frequency transaction data. We utilize this dataset to explore the heterogeneity of MPCs in response to the stimulus payments. Our results are of relevance for assessing the design of such payments in the future from a government policy standpoint. In fact, because of the timely nature of our data, our work informed the ongoing debate about appropriate policy measures and next steps in the face of the COVID-19 pandemic.

The theory behind stimulus payments links MPCs directly to the ultimate fiscal multiplier effect, i.e., the effectiveness of the payments in stimulating aggregate consumption. The results of this study suggest that targeting stimulus payments to households with low levels of liquidity in a type of recession where large sectors of the economy are shut down will have the largest effects on MPCs, and hence on fiscal multipliers.

Journal: *The Accounting Review,* 97(4), pp.187-207.

Paper: "Private Lenders' Use of Analyst Earnings Forecasts When Establishing Debt Covenant Thresholds"

Authors: Andrew Call, John Donovan, Jared Jennings

Private Lenders' Use of Analyst Earnings Forecasts When Establishing Debt Covenant Thresholds

JARED JENNINGS, Olin Business School, Washington University in St. Louis

Private debt contracts commonly include financial covenants that serve as trip wires to reallocate contingent control rights from the borrower to the lender. If a borrower violates a covenant, the lender has the right to call the loan (i.e. demand full repayment immediately) or renegotiate with the borrower. Covenants are typically based on financial ratios, and a variety of financial metrics are used for covenants. In recent years, however, earnings-based covenants have become increasingly prominent in private debt contracts. Despite the importance of earnings covenant thresholds in the private debt market, our understanding of the inputs lenders use to establish these thresholds is limited. One possible input lenders could use is the information generated by those who gather and process information about firms in the equity market to make stock recommendations, e.g. sell-side equity analysts. But we do not know whether lenders use this input, and if so, to what extent. We conduct a large-sample empirical investigation of whether lenders use sell-side analyst forecasts of the borrower's earnings as inputs when setting earnings thresholds in private debt contracts.

Framing

When negotiating earnings thresholds in debt contracts, lenders obtain private information directly from the borrower. Due to information asymmetry between lenders and borrowers, lenders have incentives to supplement this private information with additional information from external sources.

Sell-side analysts are a potential source of external information because of their experience in forecasting the borrower's earnings and because they are considered experts in understanding industry-wide and macroeconomic trends. Even if analysts do not possess more overall information than the lender about the borrower, analyst earnings

"... lenders may face pressure to explain debt covenant thresholds to federal regulators who monitor and protect the integrity of the private lending market; therefore, relying on information provided by parties external to the borrower (such as analysts) can be useful."

forecasts may supplement the lender's information set and provide information incrementally useful in negotiating earnings thresholds.

Lenders have additional incentives to use analyst earnings forecasts to establish earnings covenant thresholds. First, information asymmetry exists between the lender negotiating debt covenants (i.e., the lead arranger) and the participant lenders in the syndicate. Forecasts about the borrower's future earnings, independently provided by analysts, help the lead arranger explain debt covenant thresholds to participant lenders in the syndicate. Second, lenders may face pressure to explain debt covenant thresholds to federal regulators who monitor and protect the integrity of the private lending market; therefore, relying on information provided by parties external to the borrower (such as analysts) can be useful.

Empirical Tests

We use a sample of 7,557 private debt contracts with earnings covenants that are initiated between 1993 and 2017 and available on Dealscan to examine the role of analyst earnings forecasts in private lending. We predict that earnings covenant thresholds are set closer to analyst expectations when analysts issue more accurate historical earnings forecasts, which is economically intuitive. Economic theory tells us that market participants place more weight on a signal as that signal becomes more precise; therefore, the accuracy of analyst forecasts in prior periods (observable before the inception of the loan) provides lenders with a reasonable expectation of analysts' ability to accurately project future earnings.

We measure the proximity of earnings covenant thresholds to analyst earnings forecasts (*Analyst Forecast Accuracy*) as the negative of the absolute value of the difference between the consensus analyst forecast of the borrower's future earnings and the earnings threshold required by the debt covenant. We measure the proximity of the analyst forecast to the covenant threshold (*Analyst-Covenant Proximity*) as the negative of the absolute value of the difference between the earnings threshold required in the debt covenant and the analyst consensus earnings forecast for year $t+1$ available for the borrower at the time of contract inception.

Table 1: Analyst-Covenant Proximity and Analyst Forecast Accuracy

	(1)
Analyst Forecast Accuracy	0.813*** (9.33)
Controls Firm Fixed Effects Year Fixed Effects	Yes Yes Yes
N Adj. R-Square	7,557 0.643

Analyst-Covenant Proximity **is the dependent variable and is equal to the negative of the absolute value of the difference between the earnings threshold required in the debt covenant and the analyst consensus earnings forecast for year $t+1$ available for the borrower at the time of contract inception.** ***Analyst Forecast Accuracy*** **is equal to the negative of the absolute value of the difference between the consensus analyst forecast of the borrower's future earnings and the earnings threshold required by the debt covenant. We include control variables along with firm and year fixed effects and cluster standard errors by firm. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively. Coefficients are listed first, and t-statistics are listed second in parentheses.**

We present our primary findings in ***Table 1***. We find a positive and significant (1% level) coefficient on *Analyst Forecast Accuracy*, which is consistent with lenders using analyst earnings forecasts more to set debt covenants when the analysts historical forecast accuracy is higher. Our finding is also economically significant. A one standard deviation increase in *Analyst Forecast Accuracy* is associated with a change in *Analyst-Covenant Proximity* that is 183% larger than a one standard deviation increase in leverage. We include an extensive set of control variables such as firm performance, volatility, existence of covenants, firm fixed effects, and year fixed effects.

We perform several cross-sectional tests to further understand why lenders may use analyst forecasts when establishing covenant thresholds. We present the results from these cross-sectional tests in ***Table 2*** *(next page)*. In Column 1, we present evidence that our results are more pronounced when information asymmetry between the borrower and the lender is higher, which is more likely to occur when the debt contract requires auditor assurance on covenant compliance (*ACC Clause*). In Column 2, we find that our results are more pronounced when information asymmetry between the lead arranger and syndicate participants is higher, which we measure as the percentage of syndicate participants who previously participated in a loan with the lead arranger over the five-year period prior to debt contract inception (*Synd_Relation*). In Column 3, we find that our results are more pronounced when the lender is more likely to face regulatory scrutiny, which we measure when the bank is in the highest quintile of bank size within the regulatory district-year (*Reg_Scrutiny*). In Column 4, our results are more pronounced when the analysts have a greater industry expertise, which we measure when the analyst following the borrower also issues an industry-level recommendation for the borrower's industry (*Industry Expertise*).

A possible concern with viewing the following as evidence that lenders base covenant thresholds on analyst earnings forecasts is that it is possible that lenders do not actually use analyst earnings forecasts, but instead establish debt covenant thresholds

Table 2: Analyst-Covenant Proximity Cross-Sectional Tests

	(1)	(2)	(3)	(4)
Analyst Forecast Accuracy	0.643*** (3.45)	0.827*** (9.47)	0.751*** (4.67)	0.71*** (6.65)
ACC Clause	0.02 (1.18)			
Analyst Forecast Accuracy * ACC Clause	0.518** (2.46)			
Synd_Relation		-0.038 (-0.86)		
Analyst Forecast Accuracy * Synd_Relation		-1.855** (-2.34)		
Reg_Scrutiny			0.018* (1.78)	
Analyst Forecast Accuracy * Reg_Scrutiny			0.362* (1.82)	
Industry Expertise				0.008 (1.34)
Analyst Forecast Accuracy * Industry Expertise				0.268* (1.85)
Control Variables	Yes	Yes	Yes	Yes
Firm and Year Fixed Effects	Yes	Yes	Yes	Yes
N	3,208	7,557	4,884	7,557
Adj. R-Square	0.625	0.644	0.61	0.642

Analyst-Covenant Proximity **is the dependent variable and is equal to the negative of the absolute value of the difference between the earnings threshold required in the debt covenant and the analyst consensus earnings forecast for year** $t+1$ **available for the borrower at the time of contract inception.** ***Analyst Forecast Accuracy*** **is equal to the negative of the absolute value of the difference between the consensus analyst forecast of the borrower's future earnings and the earnings threshold required by the debt covenant. ACC Clause is an indicator variable equal to 1 if the debt contract requires auditor assurance on covenant compliance.** ***Synd_Relation*** **is equal to the percentage of syndicate participants who previously participated in a loan with the lead arranger over the five-year period prior to debt contract inception.** ***Reg_Scritiny*** **is an indicator variable equal to 1 if the bank is in the highest quintile of bank size within the regulatory district-year.** ***Industry Expertise*** **is an indicator variable equal to 1 if an analyst following the borrower also issues an industry-level recommendation for the borrower's industry. We include control variables along with firm and year fixed effects and cluster standard errors by firm. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively. Coefficients are listed first, and t-statistics are listed second in parentheses.**

based on *other* information that is correlated with analyst forecast accuracy. If this is indeed the case, then we may be making an assertion about a causal link that may be little more than a correlation. While we cannot completely rule out this possibility, we perform several additional analyses to help mitigate this concern. **First,** we control for other potential confounding factors, such as management forecast accuracy and media coverage. We also include borrower fixed effects, which help control for unobservable borrower characteristics and the endogenous matching between borrowers and lenders. **Second,** we perform an analysis at the *individual* analyst level rather than at the borrower (consensus) level, which allows us to exploit variation in individual analyst forecast accuracy for a given borrower while holding constant the borrower's information environment. **Third,** we employ an instrumental variable—analysts' forecast accuracy for firms in industries *unrelated* to the borrower—which helps address concerns about unobservable factors driving our results. **Lastly,** we examine whether debt contracts are more likely to include dynamic covenants (i.e., thresholds that vary through the term of the loan) when analysts have issued earnings forecasts for the final period of the contract. Each of these tests yields similar inferences.

We also find debt contracts are less likely to include earnings covenants when analysts do not provide earnings forecasts for the first year after contract inception. Because analyst coverage and the issuance of earnings forecasts are not randomly assigned, we identify plausibly exogenous variation in the availability of analyst forecasts using brokerage house mergers. We find that lenders are less likely to include earnings covenants in debt contracts following a reduction in the availability of analyst earnings forecasts due to brokerage house mergers.

Conclusion

Our results are useful for two reasons. **First,** while prior research provides evidence that the properties of accounting information are relevant to assessing the borrower's credit risk and making lending decisions, we do not have compelling evidence on the inputs lenders use to establish debt covenant thresholds. As noted by Skinner (2011), "We still do not have a very good understanding of the economic determinants of the structure of debt agreements." Our results add to these streams of literature by providing evidence consistent with lenders using analyst earnings forecasts to establish earnings covenant thresholds in private debt contracts, which suggests that sell-side analyst research is a useful input to debt contracting. **Second,** while a long literature focuses on the role of sell-side analysts in informing participants in the equity market, we have little evidence on the role of sell-side analysts in the debt markets. Our evidence suggests sell-side analysts provide information useful to lenders in the private debt market. Although the information produced by sell-side analysts often exhibits considerable bias and inefficiency, our findings suggest sell-side analyst research adds value to the private debt market. Thus, our research highlights a link between the private debt market and the public equity market that has not been previously appreciated, but it is a link that makes economic sense based on economic theory.

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Journal: Working Paper

Paper: “The Impact of Collateral Value on Mortgage Originations”

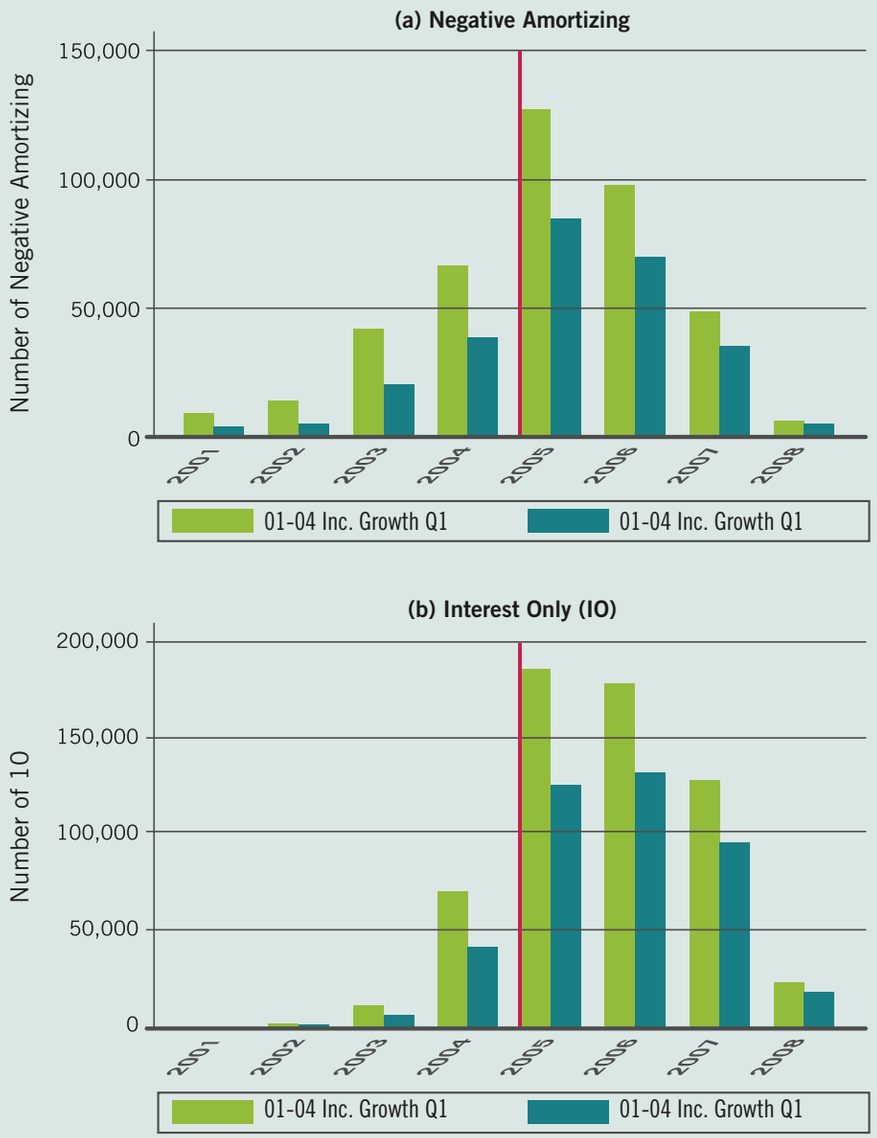
Authors: Brittany A. Lewis

The Impact of Collateral Value on Mortgage Originations

BRITTANY A. LEWIS, Olin Business School, Washington University in St. Louis

What caused the Global Financial Crisis (GFC) of 2007-09? While there were many factors, one that some have proposed is the explosive pre-crisis growth in new types of mortgages that many would consider exotic. I will refer to them as “alternative mortgages.” These mortgages not only substantially expanded credit to households but were also followed by large-scale mortgage defaults that were a key factor in precipitating the crisis. However, what this view does not explain is why this expansion of credit via non-traditional alternative mortgages disproportionately affected some socioeconomic groups relative to others. Thus, the story is incomplete. We need to understand why some groups received more credit through such mortgages and why some groups defaulted more than others. In this paper, I explain that a new law passed by Congress provides an explanation. Specifically, I examine how a legislative change in 2005, in the form of a new Act, changed the mortgage lending landscape significantly and altered the allocation of mortgage credit. Specifically, this Act that Congress passed in 2005 led to the expansion of alternative mortgage products, and these impacted borrowers with low income growth and those in minority-dominant zip codes differently from others. Understanding this better can help us to more deeply comprehend the multifaceted effects of this policy, which can then inform possible future Congressional legislative acts.

Figure 1. Mortgage Product by Zip Code Income Growth Quartile



The figure depicts the number of mortgages originated each year for a given product type in zip codes that are in the bottom quartile of 2001 to 2004 income growth (Q1) and the top quartile of 2001 to 2004 income growth (Q4).

To conduct this exercise, I first begin by establishing stylized facts about mortgage originations leading up to the GFC.

Fact 1: *The expansion of alternative mortgages accelerated rapidly beginning in 2005 and crashed in 2008.*

Fact 2: *The expansion of these alternative mortgages was more prominent among borrowers with low rates of income growth and those in minority-dominant zip codes.*

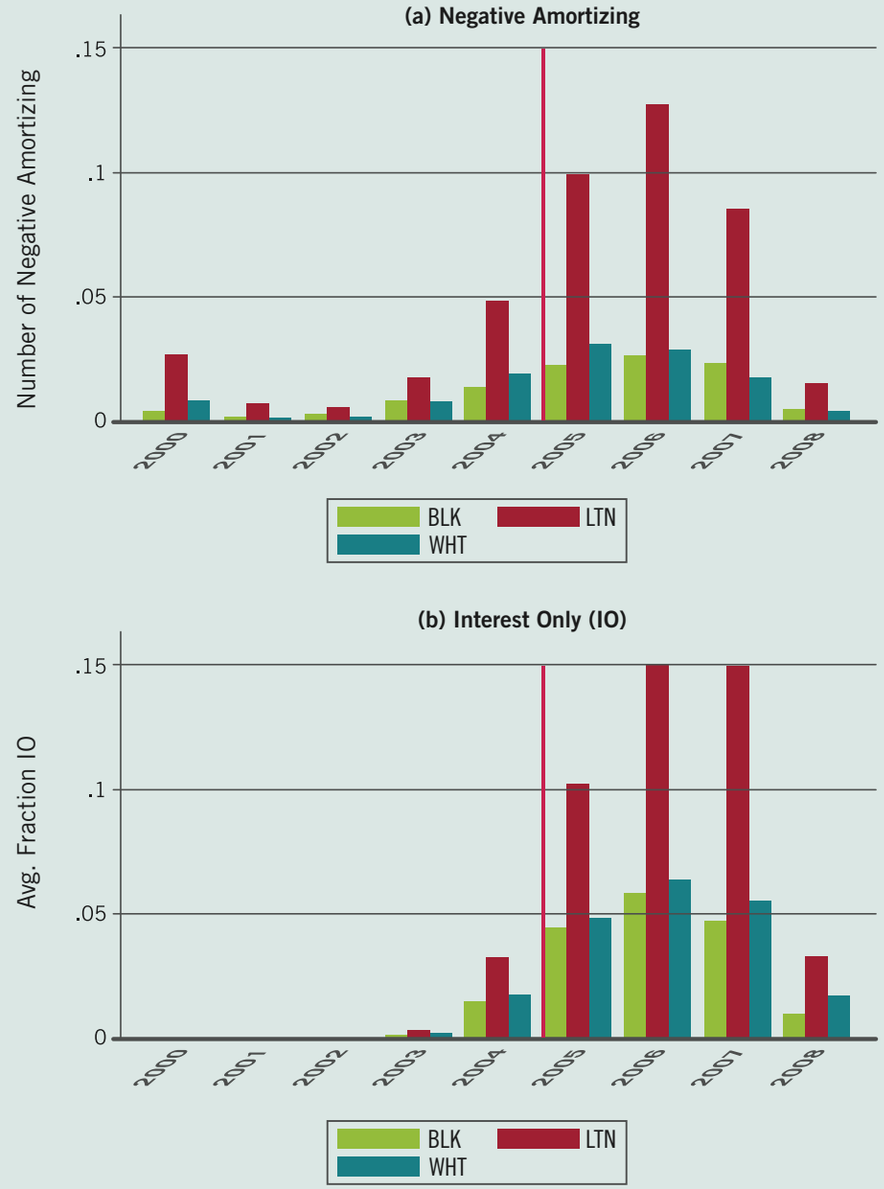
In *Figure 1*, I plot originations of negative amortizing and interest only (IO) mortgages from 2001 to 2008. Negative amortizing mortgages are mortgages that do not pay the full amount of interest and principal to amortize or pay down the loan over time. Therefore, the interest owed and not paid is added to the balance of the mortgage and recapitalized, so that interest is owed on the deferred interest. In this way negative-amortizing products increase borrowers' indebtedness over time, rather than decreasing it. Interest-only mortgage products include Option Adjustable Rate Mortgages (ARMs) which offer the option to pay the fully amortizing principal and interest, only the interest payment, or a minimum amount that is less than the interest accrued. These were one of the main types of negative amortizing mortgage products originated in the lead up to the Global Financial Crisis. These alternative mortgage products offered an artificially low interest payment for an initial time period before the payment reset to the fully amortizing price at the market rate. The rates typically reset to the market rate one or two years after origination. This means that borrowers may experience payment shock if the monthly payment that they reset to is higher than their artificially low initial payments on these alternative products.

These figures illuminate a number of interesting things. First, the figures show that these alternative mortgages increased suddenly in 2005 and remained at elevated levels in 2006 and 2007, before falling dramatically in 2008, with the onset of the Global Financial Crisis. Second, the figures show that zip codes in which borrowers experienced low rates of income growth (those in the first quartile of 2001 to 2004 income growth), received disproportionately more of these mortgage products than borrowers in areas with high income growth (those in the fourth quartile of 2001 to 2004 income growth). Low rate of income growth is highly correlated with a high level of income volatility, i.e. households with low rates of income growth also have more volatile incomes. For this reason, I use low income growth as a proxy for high income volatility, since individual level income data are difficult to access.

These alternative mortgage products are appealing to borrowers with high income

"Low rate of income growth is highly correlated with a high level of income volatility, i.e. households with low rates of income growth also have more volatile incomes ... I use low income growth as a proxy for high income volatility, since individual level income data are difficult to access."

Figure 2. Mortgage Product by Zip Code Percent Minority



The figure depicts the number of mortgages originated each year for a given product type in zip codes that are in the bottom quartile of 2001 to 2004 income growth (Q1) and the top quartile of 2001 to 2004 income growth (Q4).

volatility because they offer the ability to postpone the full interest and principal payment at times when their incomes may be low, and to repay the interest and principal owed on the mortgages at a time when their incomes are high. Additionally, borrowers were qualified for the mortgage based on the low introductory monthly payments, allowing borrowers to qualify for mortgages for which they may not otherwise be approved.

In *Figure 2*, I plot the fraction of alternative mortgage products originated, relative to all originations, in majority Black, Latino, and white zip codes. Zip codes are defined as majority Black or Latino if they have above 30% of inhabitants identifying as the respective race and less than 70% of the zip code identifying as white. Zip codes with above 84% of inhabitants identifying as white are defined to majority white zip codes. I find that the zip codes with more than 30% Black or Latino inhabitants received a disproportionately high fraction of alternative mortgages. This indicates that the likelihood of finding these alternative mortgages in areas with low income growth and high minority populations was higher than in areas with high income growth and a dominant white population. After 2005, the fraction of alternative mortgages (negative amortizing and interest only mortgages plotted in *Figure 2*, other mortgage types shown later in regressions) increased the most in Latino zip codes, the second most in white zip codes, and the third most in Black zip codes. I also find that the fraction of other alternative mortgage products, which feature initial low monthly payments that reset to higher payments, also increased the most for minority zip codes compared to white zip codes. This pattern is consistent with Rugh (2015)'s observation that Latino borrowers continued to receive alternative mortgages until just before the Global Financial Crisis, whereas white borrowers seemed to know that it was time to retreat from the mortgage market.

What explains these behavioral patterns? One potential factor for this increase in alternative mortgages in high-income-volatility, minority-dominant zip codes was a 2005 Act of Congress called the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA). BAPCPA granted preferred bankruptcy status to private-label mortgage collateral, or risky mortgage collateral, used in the sale and repurchase market, called the "repo" market. The repo market is a large wholesale funding market where dealer-banks make and receive repo loans. The typical transaction involves the borrowing institution providing some securities as collateral for a short-term loan from the lending institution. That is, these loans serve the same economic function as collateralized loans, except that the exchange of collateral is considered an outright sale followed by a repurchase. This outright sale of collateral allowed large dealer-banks to repledge, or reuse, collateral in order to increase their leverage.

In another paper, (Lewis, 2023), I document that this Act created an increase in credit supply by allowing the same collateral to back multiple repo loans, which permitted an increase in the amount of leverage and credit in the economy. Moreover, by receiving collateral in one transaction and reusing the same collateral to borrow in a second transaction at different lending terms, dealers generated a "money multiplier" that increased credit supply. BAPCPA only affected the bankruptcy status of private-label mortgage repo collateral, which meant that the credit supply increase was concentrated in the private-label mortgage market. Private-label mortgages were made up of two types of mortgages, (i) subprime mortgages, defined as fully amortizing mortgages to borrowers with credit scores below 620, and (ii) alternative mortgages, called Alt-A or Alternate-A mortgages since they were thought to be near-prime mortgages due to their higher credit scores. Alternative mortgages expanded rapidly following BAPCPA.

In this paper, I hypothesize that by increasing the value of collateral in the secondary market by making it reusable across multiple transactions, BAPCPA increased institutional demand for private-label mortgages that could be used as collateral in repos. The institutions that used this collateral for borrowing were also providers of credit to others. Thus, they were a part of the set of events triggered by BAPCPA that led to an overall increase in credit supply. Since home prices were close to their peak by the time BAPCPA was passed in 2005 and the Federal Reserve was raising interest rates in an uninterrupted fashion, traditional fully-amortizing subprime mortgages became very expensive. Thus, to attract new borrowers into the private-label mortgage market, lenders were keen to issue mortgages that tapped into a new borrower segment, one consisting of borrowers with high credit scores but volatile income and potentially low wealth; these borrowers had previously been locked out of the mortgage market.

By expanding Alt-A mortgages, lenders could lower initial mortgage payments at a time when mortgages were very expensive thereby enabling these borrowers to access mortgages that initially seemed affordable. The alternative products such as negative-amortizing and interest-only mortgages allowed lenders to lower the mortgage payments owed during the first few years of the mortgage and push the higher, fully-amortizing, payments later in the term of the mortgage.

I develop a model that interprets BAPCPA as an increase in collateral value, since it allowed collateral to be repledged, which lowered dealers' cost of capital. Post-BAPCPA, dealers could use the collateral posted with them to back their own borrowing, rather than using their own scarce capital to support their borrowing. In the model, the increased collateral value feeds back into the interest rate that dealer-banks charge borrowers. The model illustrates that raising collateral value lowers interest rates, which then allows new home borrowers to enter the market. These borrowers had high income volatility. Thus not only did BAPCPA lead to a money multiplier as I show (see Lewis (2023)), but it also generated a new mortgage demand stimulation mechanism — by decreasing initial interest rates, lenders stimulated the demand for mortgages, which led to new types of mortgages (with higher embedded default risk in the later stages of the mortgage term) to high-income-volatility borrowers.

In the model that I develop, there are two segmented markets. One is for borrowers with low income volatility and one is for borrowers with high income volatility. In line with Piskorski and Tchistyi (2010), I assume that the optimal mortgage contract in the market for borrowers with high income volatility is the Option-ARM (or similar product such as a negative-amortizing, interest-only, balloon, two-step mortgages, etc.). The optimal contract in the market for borrowers with low income volatility is the fixed rate (or fully amortizing) mortgage. Since the markets are segmented, if price in one market was too high for borrowers, borrowers would be locked out of this market and we would see lending in only one market. Thus, it may appear as if there is only one type of mortgage contract (fully amortizing), when in fact both types of mortgage contracts were always optimal in their respective markets.

When the collateral value increases for the mortgages taken by high-income-volatility borrowers, the interest rate that the dealer-banks charge these borrowers falls. If the mortgage rate prior to the increase in collateral value was above the highest price borrowers were willing to pay (their reservation price), then a sufficiently large increase in collateral value could cause the mortgage rate to fall below these borrowers' reservation price, and we should see new borrowers—who had been previously locked out—enter this market. This view helps us to understand why alternative-A mortgages increased in volume significantly after 2005. It is consistent with the narrative that alternative mortgages had existed since the 1980s but were never rolled out in as high of volume the way they were just prior to the Global Financial Crisis. The model provides additional empirical predictions that can be empirically tested using actual data.

To empirically test these predictions, I use the following research design. I use a difference-in-differences (DiD) regression strategy to test whether zip codes with higher exposure to BAPCPA increased their originations of alternative mortgages relative to low-exposure zip codes in the period after BAPCPA compared to the period before BAPCPA. To originate mortgages, dealer-banks relied on independent mortgage companies (IMCs) which they funded via repo warehouse lines of credit. Thus, I use the market share of independent mortgage companies as a measure of how exposed a zip code was to the policy change. The low exposure zip codes provide a counterfactual, so that my research design tests the magnitude of the increase in originations due to BAPCPA after subtracting out the counterfactual.

The model implies that increasing the value of collateral should drive down the interest rate. Consistently, I find that the average initial interest rate decreases after BAPCPA in areas that are more "treated" (i.e. where the effect of BAPCPA is identifiably stronger) relative to those that are less treated. Additionally,

Figure 3. Triple Difference Regression

	fracnegam	frachybrid	fractwostep	fracarm	fracio
$Post_t$ x $IMCMarketShare_{z,\ 2004}$	0.0465***	-0.0168**	0.0031***	-0.0498***	0.0269***
	(0.0061)	(0.0076)-	(0.0011)	(0.0153)	(0.0064)
$Post_t$ x $IncomeGrowth_{z,\ 2001\text{-}2004}$	0.0366*	0.0395	0.0045	-0.0965**	0.0595***
	(0.0216)	(0.0240)	(0.0036)	(0.0485)	(0.0211)
$Post_t$ x $IMCMarketShare_{z,\ 2004}$	-0.1075*	-0.1303*	-0.0129	-0.2712*	-0.1718***
x $IncomeGrowth_{z,\ 2001\text{-}2004}$	(0.0649)	(0.0724)	(0.0114)	(0.1428)	(0.0641)
	0.0168***	-0.0472***	0.0002	0.2460***	0.0407***
cons	(0.0015)	(0.0018)	(0.0002)	(0.0037)	(0.0015)
ZipFE	Yes	Yes	Yes	Yes	Yes
StatexMonthFE	Yes	Yes	Yes	Yes	Yes
r2	0.3893	0.0969	0.0742	0.2849	0.3227
N	491817	491817	491817	491817	491817

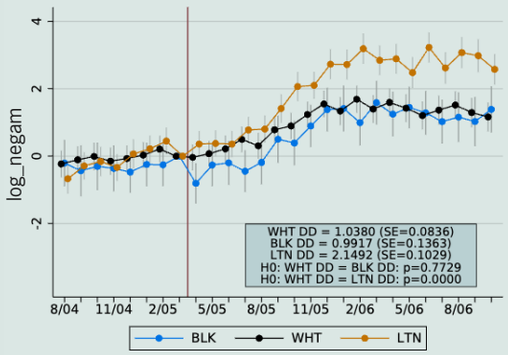
Table reports the response of housing market characteristics in a given zip as a function of the interaction term between 2004 market share of independent mortgage companies (IMCs) x income growth between 2001 and 2004 in that zip x the post period.

following BAPCPA, the average credit score for newly-originated mortgages increases in more-treated zip codes relative to less-treated zip codes. This is consistent with an effect at the "extensive margin," i.e. the entry of new borrowers into the market. If they were second-home buyers, their credit scores would be decreasing. I also find that the majority of originations were purchases rather refinances, and that the rate of second-home purchases is falling over this time period.

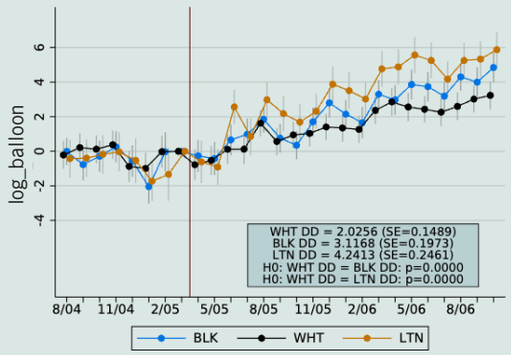
The model is also useful because its framework predicts that we should see an expansion of alternative mortgages, and this growth should be focused in zip codes that have borrowers with higher income volatility, or lower income growth from 2001 to 2004. The paper uses a triple difference research design to investigate this. I compare mortgage originations pre versus post policy change in areas that have high versus low exposure to the shock. I further compare zip codes that have borrowers with high income volatility to those that have low income volatility when both zip codes have high exposure to the BAPCPA change and also conduct the same comparison between an analogous pair of zip codes that both have low exposure to the BAPCPA change. In the table on the next page, I report the coefficient on the triple interaction term, which interacts an indicator for the post period with high IMC market share and with high income growth. The regression coefficient on this triple interaction term is negative and has a statistically significant effect on the fraction of mortgage originations that are alternative mortgages (negative amortizing, hybrid, two-step, ARM, and IO mortgages) in a zip code. The negative coefficient indicates that as borrowers' income growth decreases, or their income volatility increases, the fraction of these alternative mortgages in the overall population of mortgages increases. This indicates that the expansion in alternative mortgage products in response to BAPCPA was concentrated in zip codes with low borrower income growth, consistent with the prediction of the model.

In *Figures 4* and 5 (next pages), I statistically test whether zip codes that have a predominance of minority borrowers receive a disproportionate portion of the increase in these alternative mortgages. I estimate a difference-in-differences regression separately for zip codes that have majority Black, Latino, and white borrowers.

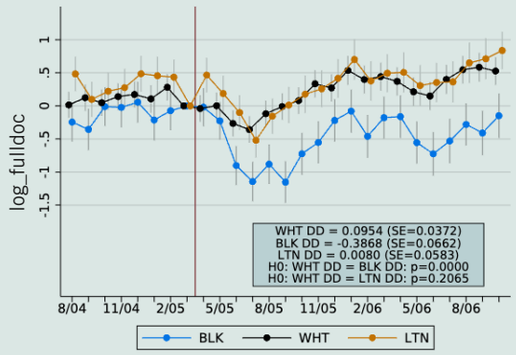
Figure 4. Difference-In-Differences (DiD) by Race Subcategories – Mortgage Products



(a) Negative Amortizing



(b) Balloons



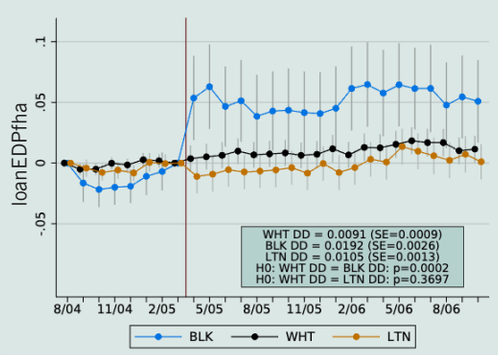
(c) Full Documentation

Figure plots the dynamic response of the coefficient of interest from difference-in-differences regression in majority Black, Latino, and white zip codes.

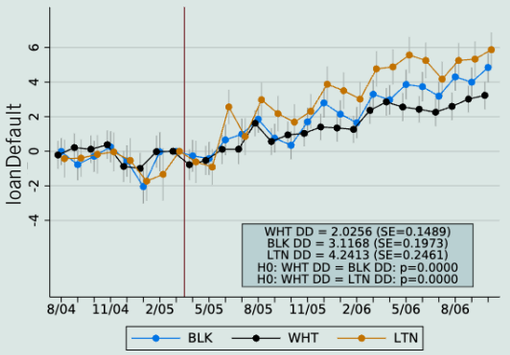
The difference between the coefficients for the different races is equivalent to the triple difference, and the statistical significance is reported in the key in each chart. The empirical analysis shows that zip codes that had a majority Latino borrowers received more negative-amortizing and balloon mortgages following BAPCPA compared to zip codes that had a majority of white borrowers. Zip codes with a majority of Black borrowers also received more balloon mortgages compared to zip codes with a majority of white borrowers after BAPCPA. I also show that zip codes with a majority of Black borrowers received fewer full-documentation mortgages (in which all income and assets are required to be documented), compared to zip codes with a majority of white and Latino borrowers.

These mortgages are riskier mortgage products, due to their riskier amortization schedules and lack of full income documentation. Thus, I test whether early payment defaults according to the FHA definition (where the loan experiences 60 days delinquency within the first six months – typically a measure for lender risk management issues), and mortgage default within five years of origination increase disproportionately for zip codes with a majority of Black or Hispanic borrowers.

Figure 5. Difference-In-Differences (DiD) by Race Subcategories – Default



(a) Early Payment Default



(b) Total Default

Figure plots the dynamic response of the coefficient of interest from difference-in-differences regression in majority Black, Latino, and white zip codes.

I find that early payment defaults increase the most for zip codes with a majority of Black borrowers. However, defaults within five years of origination increase the most for zip codes with a majority of Latino borrowers. The results for early payment default are consistent with zip codes with a majority of Black borrowers receiving mortgages with riskier amortization structures. In these mortgages, the borrower's ability to repay was based on the artificially low introductory payments and income was not fully documented. The increase in defaults within five years of origination in zip codes with a majority of Latino borrowers is consistent with the large increase in negative-amortizing mortgages in these zip codes—with these mortgages, borrower equity decreases over time, and these borrowers were likely to experience a payment shock when the artificially-low monthly payment was reset to the higher fully-amortizing payment.

Some of the lingering questions around the GFC include: why was the expansion of Alt-A mortgages so sudden and why were the majority of defaults concentrated in this segment of the market, despite borrowers having high credit scores? The model I develop helps to explain this. There was an expansion of Alt-A mortgages after BAPCPA. This is because these mortgages were too expensive for home buyers prior to BAPCPA. Once BAPCPA lowered dealer-banks' cost of capital, the cost to borrowers decreased, and we saw a rapid expansion of these mortgages being offered to borrowers who had been previously locked out of the housing market. These borrowers had high income volatility and high credit scores. The majority of defaults were concentrated in this segment because these mortgages had very risky amortization structures, with the ability to repay them being based on their artificially low initial monthly payments, and sufficiently high future income, but without lender verification of the reasonableness of the assumption of high future income.

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Author Biographies

Jared Jennings (page 30) is an Associate Professor of Accounting at Olin Business School, Washington University in St. Louis. Professor Jennings joined Olin in 2012 after graduating from the University of Washington. Prior to his Ph.D., he was an auditor at Deloitte. His research primarily focuses on information intermediaries, textual analysis, and financial reporting.

Marcin Kacperczyk (page 6), is a Professor of Finance at the Imperial College London Business School and a Research Fellow at the Centre for Economic Policy and Research. In addition, he serves as an Associate Editor of Financial Management, Management Science, Review of Financial Studies and Review of Finance, and is a former Research Fellow of the National Bureau of Economic Research. Professor Kacperczyk's research focuses mostly on financial markets, financial intermediation, and asset management. He obtained a Ph.D. in finance from the Ross School of Business at the University of Michigan.

Mark Leary (page 14) is Co-Vice Dean of Faculty and Research and Professor of Finance at Olin Business School, Washington University in St. Louis. Professor Leary joined Olin in 2010. He taught previously at Cornell University and, prior to his academic career, worked for CVS Corp. and the Federal Reserve Bank of NY. His research investigates the motives behind corporate financial policy decisions, including leverage, security issuance, dividend and share repurchase decisions. He received his Ph.D. from Duke University in 2006.

Brittany A. Lewis (page 36) joined the Olin Business School at Washington University in St. Louis as an Assistant Professor of Finance in July 2022. She is currently teaching Research Methods in Finance in Olin's Master of Science in Finance program and her research focuses on banking and financial institutions, finance/investments, and financial economics. Professor Lewis received her Ph.D. from Northwestern University in 2020.

Michaela Pagel (page 22) is an Associate Professor of Finance at Olin Business School, Washington University in St. Louis, NBER Faculty Research Fellow, and CEPR Research Affiliate (Household Finance Network Member). Professor Pagel holds a Ph.D. from University of California at Berkeley. Her primary research interests include household finance and behavioral economics.

Tatiana Vdovina (page 14) is currently a Ph.D. student in Finance at Olin Business School, Washington University in St. Louis. Her primary research interests are in international finance, household finance with a focus on experimental work, and macroeconomics. She is also a Ph.D. Scholar at the Wells Fargo Advisors Center for Finance and Accounting Research.

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Timothy G. Solberg, CFA
Professor of Practice in Finance
Academic Director of Corporate Finance and Investments Platform
314-935-7270
solbergtg@wustl.edu

Leah Maniaci
Program Manager of Practicums
leahm@wustl.edu

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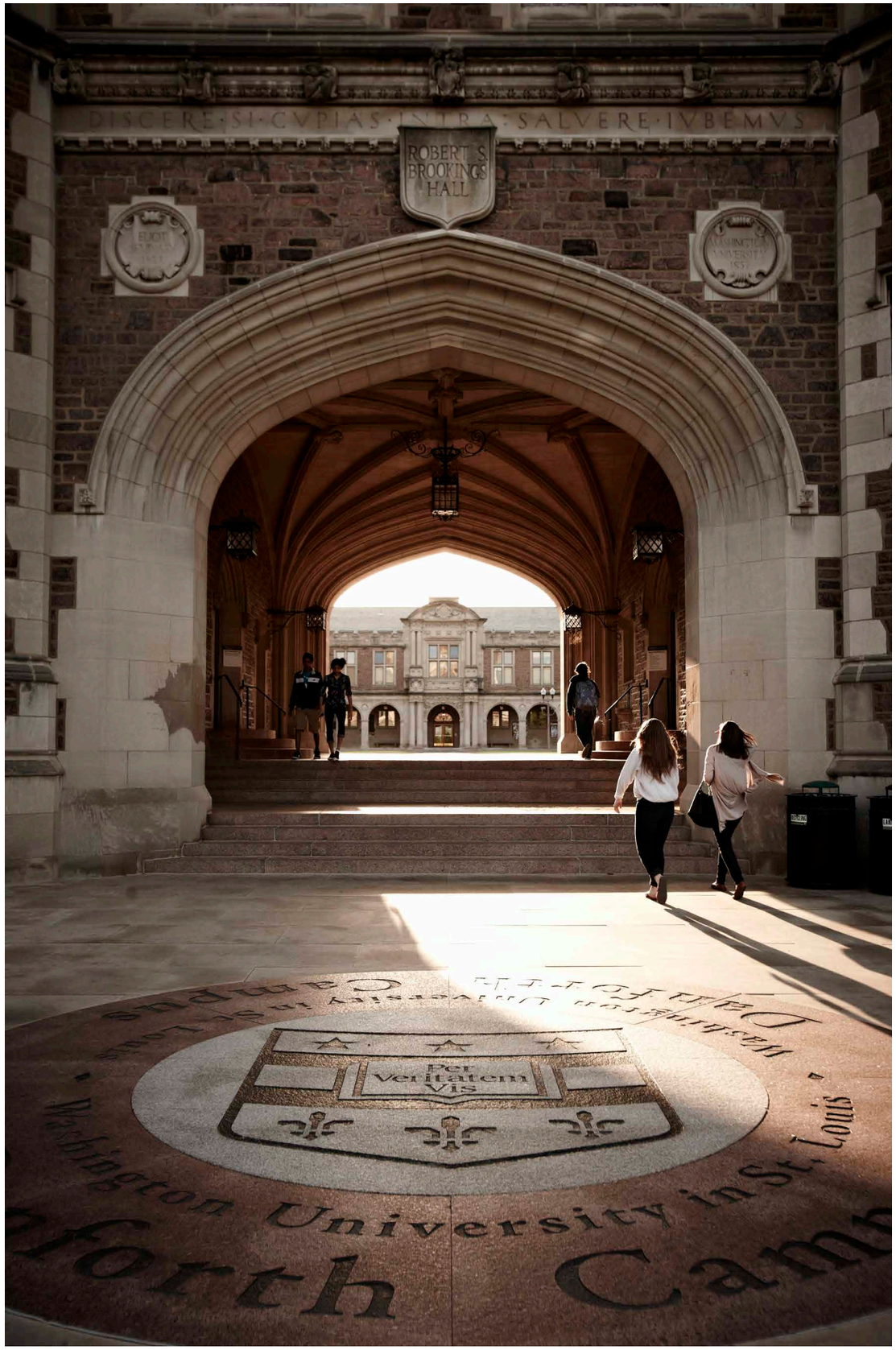
- You can get the rankings for any chosen time-period; the default ranking is for the period 2000-2023.
- You can get either a per-capita ranking (which divides the total research output of the department by the number of tenured and tenure-track Finance faculty) or a gross ranking that does not adjust for faculty size. The default setting is the per-capita calculation.
- You can choose the journals included in the rankings, i.e., you can select any subset of the journals included. The default ranking includes all of them.

POETS & QUANTS

Poets & Quants put a spotlight on the rankings website in May 2023 with an interview with the Dean of University of California-Berkeley Haas School of Business. CFAR's ranking named Berkeley Haas as the top business school for finance research based on publications in the world's most influential journals. The article can be found here: https://poetsandquants.com/2023/05/30/new-ranking-crowns-a-top-b-school-for-finance-research-and-the-winner-may-surprise-you/.



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Full-time Finance Faculty

Deniz Aydin
Assistant Professor of Finance
PhD, Stanford University
Research interests: finance, empirical macroeconomics and applied microeconomics

Jian Cai
Senior Lecturer in Finance
PhD, Washington University in St. Louis
Research interests: corporate finance, corporate governance, executive compensation, career concerns, financial intermediation, financial institutions and empirical asset pricing

William Cassidy
Assistant Professor of Finance
PhD, University of Chicago
Research interests: asset pricing and political economy

Grant Clayton
Lecturer in Finance
PhD, Northwestern University
Research interests: empirical corporate finance

Charles J. Cuny
Senior Lecturer in Finance
PhD, Stanford University
Research interests: capital structure, financial innovation, employee stock options

Jeremy Degenhart
Professor of Practice in Finance
Research interests: venture capital, private equity

Kabir Dutta
Professor of Practice in Finance
PhD, University of Pennsylvania-Wharton
Research interests: credit, operational, and enterprise risk, exploratory data analysis for financial intelligence, policy studies for banking regulation, corporate governance, option theory and derivative, fixed income

Philip H. Dybvig
Boatmen's Bancshares Professor of Banking and Finance and Economic Sciences Laureate
PhD, Yale University
Research interests: banking, corporate finance, asset pricing, banking, financial markets, fixed-income securities, industrial organization, portfolio management

Nicolae Garleanu
H. Frederick Hagemann Jr. Professor of Finance
PhD, Stanford University
Research interests: asset pricing, finance/investments, financial economics, option pricing

Armando R. Gomes
Associate Professor of Finance
PhD, Harvard University
Research interests: corporate finance, mergers and acquisitions, corporate governance, economic theory

Todd Gormley
Professor of Finance, Area Chair and Academic Director of GMF
PhD, Massachusetts Institute of Technology
Research interests: corporate governance, empirical methods, mutual funds

Brett Green
Professor of Finance
PhD, Stanford University
Research interests: financial economics, information economics, corporate finance, contract theory, development economics, sports economics

Xing Huang
Associate Professor of Finance
Research Interests: behavioral finance, investor behavior, market efficiency, information acquisition, mutual funds, household finance, asset pricing

Mark Leary
Co-Vice Dean of Faculty and Research and Professor of Finance
PhD, Duke University
Research interests: empirical corporate finance, capital structure, payout policy, security issuance, financial intermediaries

Brittany A. Lewis
Assistant Professor of Finance
PhD, Northwestern University
Research Interests: financial intermediation and household finance

Hong Liu
Fossett Distinguished Professor of Finance and Director of the Master's in Finance Program
PhD, University of Pennsylvania
Research interests: optimal consumption and investment with frictions, asset pricings, market microstructure

Asaf Manela
Associate Professor of Finance
PhD, University of Chicago
Research interests: asset pricing, financial intermediation, machine learning, text analysis, and information economics

Maarten Meeuwis
Assistant Professor of Finance
PhD, Massachusetts Institute of Technology
Research interests: asset pricing, household finance, macroeconomics

Todd T. Milbourn
Hubert C. & Dorothy R. Moog Professor of Finance
PhD, Indiana University
Research interests: corporate finance, managerial career concerns, management compensation, economics of asymmetric information

Lorenzo Naranjo
Senior Lecturer in Finance
PhD, New York University
Research interests: theoretical and empirical asset pricing, derivatives, fixed-income, commodities

Andreas Neuhierl
Assistant Professor of Finance
PhD, Northwestern University
Research interests: econometrics, monetary policy, asset pricing, finance/investments

Michaela Pagel
Associate Professor of Finance
PhD, University of California at Berkeley
Research interests: household finance and behavioral economics

Sakya Sarkar
Senior Lecturer in Finance
PhD, University of Southern California
Research interests: asset pricing, finance/investments

Koray Sayili
Senior Lecturer in Finance
PhD, Queen's University
Research interests: innovation policies, entrepreneurship policies, human capital, institutional investors, ESG investment

Linda Schilling
Assistant Professor of Finance
PhD, University of Bonn
Research interests: financial intermediation, financial regulation, asset pricing, cryptocurrencies, exchange rates, coordination games, platform design, blockchain

Janis Skrastins
Assistant Professor of Finance
PhD, London Business School
Research interests: empirical corporate finance, banking, financial intermediation, organizational design, emerging markets

Timothy Solberg
Professor of Practice in Finance and Director of the Corporate Finance & Investments Platform; Academic Director of the Business of the Arts Program
Research interests: pensions, endowments and foundations

Buddy Soubra
Professor of Practice in Finance
PhD, New York University
Research interests: finance in a world of asymmetric information

Mark P. Taylor
Donald Danforth Jr. Distinguished Professor of Finance
DSc Higher Doctorate, University of Warwick
Research interests: economics, financial markets, international finance, international macroeconomics, macroeconomics

Anjan Thakor
Director of WFA-CFAR and John E. Simon Professor of Finance
PhD, Northwestern University
Research interests: corporate finance, financial intermediation, economics of asymmetric information

Margarita Tsoutsoura
Associate Professor of Finance
PhD, Columbia University
Research interests: corporate finance, governance, political economy

Nishant Vats
Assistant Professor of Finance
PhD, University of Chicago
Research interests: finance & development, financial intermediation and corporate finance

Guofu Zhou
Frederick Bierman & James E. Spears Professor of Finance
PhD, Duke University
Research interests: investment strategies, big data, machine learning, forecasting, technical analysis, asset allocation, anomalies, asymmetric information, asset pricing tests and econometric methods

Full-time Accounting Faculty

John Barrios
Assistant Professor of Accounting
PhD, University of Miami
Research interests: accounting and disclosure, entrepreneurship, governance, labor economics, industrial organization and productivity, regulation

Jeremy Bertomeu
Associate Professor of Accounting
PhD, Carnegie Mellon University
Research interests: financial accounting, regulation

Edwige Cheynel
Associate Professor of Accounting
PhD, Carnegie Mellon University
Research interests: financial disclosure and capital markets

Thomas D. Fields
Senior Lecturer in Accounting
PhD, Northwestern University
Research interests: accounting, financial reporting

Richard Frankel
Nicholas Dopuch Professor of Accounting
PhD, Stanford University
Research interests: accounting-based valuation, voluntary disclosure, information asymmetry, effects of accounting on firm value

Mahendra R. Gupta
Former Dean, Geraldine J. and Robert L. Virgil Professor of Accounting and Management
PhD, Stanford University
Research interests: managerial accounting, strategic cost management and control

Jared Jennings
Associate Professor of Accounting
PhD, University of Washington
Research interests: information intermediaries, textual analysis, financial reporting

Zachary Kaplan
Assistant Professor of Accounting
PhD, University of Chicago
Research interests: managerial disclosure strategy, analyst forecast strategy, earnings expectations

Ronald R. King
Emeritus Professor of Accounting
PhD, The University of Arizona
Research interests: teaching and learning and the role of the modern business school

Douglas Laporte
Assistant Professor of Accounting
PhD, Stanford University
Research interests: valuation, entrepreneurial finance and disclosure

Xiumin Martin
Professor of Accounting
PhD, University of Missouri–Columbia
Research interests: financial accounting, voluntary disclosure, accounting information in assets valuation

Richard Palmer
Senior Lecturer in Accounting
PhD, Southern Illinois University-Carbondale
Research interests: financial processes, change management, management control systems, auditing, fraudulent financial reporting

Jeffrey Plunket
Professor of Practice in Accounting
JD, St. Louis University
Research interests: tax accounting, holding company and financing structures, cash management, multinational tax planning

MaryJane Rabier
Assistant Professor of Accounting
PhD, University of Maryland
Research interests: financial accounting, financial reporting, voluntary disclosure, mergers and acquisitions, earnings management, human capital, corporate strategy, conference calls

Mark E. Soczek
Director, MACC and Senior Lecturer in Accounting
PhD, Northwestern University
Research interests: corporate disclosure policy, financial reporting

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