

Samar Issa, PhD<sup>1</sup>; Aleksandr V. Gevorkyan, PhD<sup>2</sup>  
<sup>1</sup> Saint Peter's University, <sup>2</sup> St. John's University

## Abstract

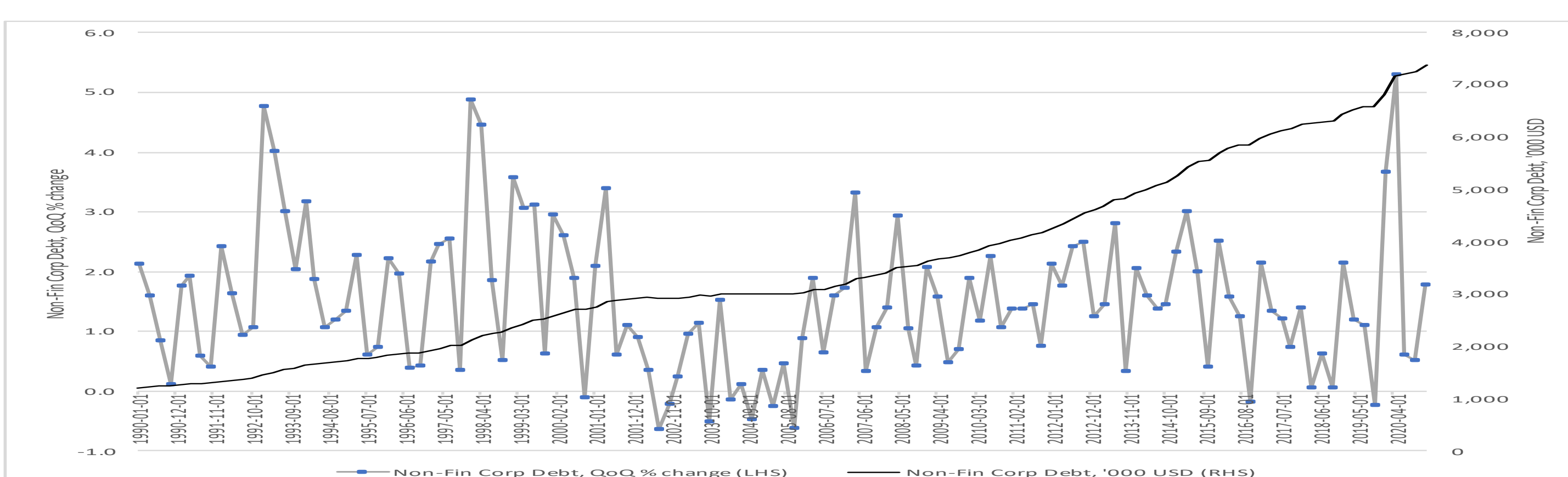
This paper develops an empirical model of corporate capital structure and overleveraging. Motivated by the Stein (2012) model for optimal debt this paper extends the analysis into the corporate sector for a sample of 89 corporations across six leading industries: technology, financial, pharmaceutical, auto, airline and energy. Calculated for each firm, the model allows to infer an industry specific default risk measuring overleveraging as the difference between actual and optimal debt. The results from the above estimations suggest that the estimated corporate excess debt has largely been moving up, spiking around the crisis period, i.e., the global financial crisis and then continuing into recovery. This trend is consistent with an increase in the actual debt across industries, though the average excess debt ratios vary by sector. These results are informative for more applied future outlook studies assessing the pandemic scenarios. More broadly, we argue that the results of this paper also conform to the general Kaleckian-Minskyan analytical framework suggesting a possibility of rising speculative bubble in the corporate sector over the medium term.

## Introduction

Following the 2008 Global Financial Crisis (GFC), there has been a rise in academic and policy research on the problems of corporate debt sustainability. The COVID-19 pandemic has reignited the urgency of the topic. This paper contributes to recent academic research on overleveraging and the effects of macroeconomic instability shocks on asset prices, financial markets, and the balance sheets of corporations; those shocks might be destabilizing rather than mean reverting. At a macro level this study also raises questions about speculative debt build-up reminiscent of the Kalecki principle of increasing risk (Kalecki, 1937) and Minskyan financial instability hypothesis (FIH) and speculative cycles (Minsky, 1986).

This paper adds to the literature by examining a new dataset comprised of 89 corporations from six industries: technology, financial, pharmaceutical, auto, airline and energy with core annual data covering the period from 2000 to 2018. Estimates for the optimal debt ratios are based on the data on capital gain/loss, market interest rates, and the productivity of capital. More broadly, Figure 1 adds to our discussion with recent observations on actual debt evolutions in the U.S. non-financial corporate sector. There is a clear sign that overleveraging across industries is likely on the rise again. The story here is not just industry specific but has relevance on a larger macro scale.

Figure 1 . Actual debt evolution in the U.S. non-financial sector



Source: FRED (2021)

## Estimation Methodology and Variables

Optimal leverage is given by:

$$f^*(t) = [(r - i) + \beta - \alpha y(t) - \frac{(\frac{1}{2})(\sigma_p^2 - \sigma_i \sigma_p \rho)}{\sigma^2}]$$

such that

$$Risk = \sigma^2 = \sigma_i + \sigma_p - (2\rho_{ip}\sigma_i\sigma_p) \quad (2)$$

where  $r$  is the bank's capital gain (or loss);  $i$  is the credit cost of banks;  $\beta$  is the productivity of capital;  $y(t)$  is the deviation of capital gain from its trend;  $\alpha y(t)$  is the variance of  $\beta$  (the productivity of capital);  $\sigma^2$  is the variance; and  $\rho$  represents the negative-correlation coefficient between interest rate and capital gain.

Using the abovementioned variables, the optimal-and actual-debt ratios were calculated for a sample of 89 companies. The primary sources for corporate balance sheets data were Bloomberg terminals and FactSet. We undertake our estimations using the full sample which incorporates firm-specific variables on the leading companies from six largest industries (as per S&P500 ranking). Each industry sub-sample includes up to top twenty publicly traded companies (depending on data availability) based on their market capitalization and total assets compared to others in the respective industry.

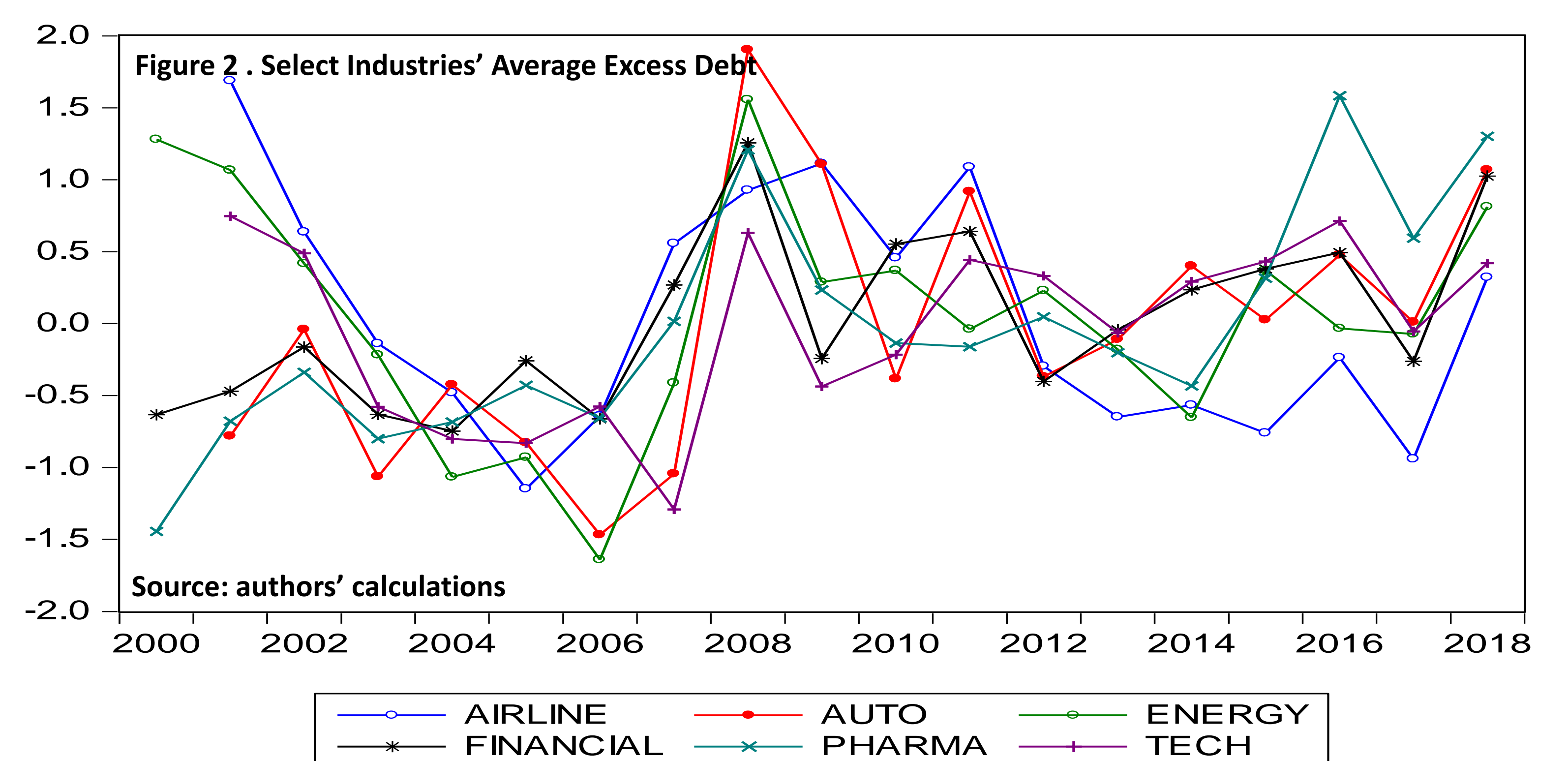
## Contact

Samar Issa  
 Saint Peter's University  
 Email: [sisso@saintpeters.edu](mailto:sisso@saintpeters.edu)

Aleksandr V. Gevorkyan  
 St. John's University  
 Email: [gevorkya@stjohns.edu](mailto:gevorkya@stjohns.edu)

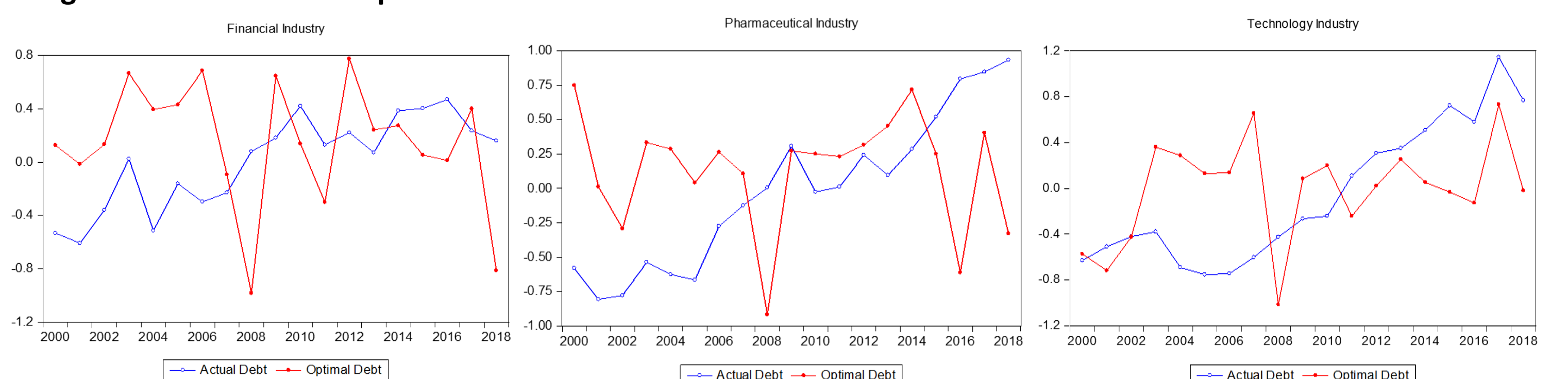
## Results and Discussion

The results from our estimations suggest that the estimated corporate excess debt has largely been moving up, spiking around the crisis period, i.e., the GFC, and then continuing into recovery (Figure 2). This trend is consistent with an increase in the actual debt across industries, though the average excess debt ratios vary by sector. The optimal and actual debt ratios for most of the firms exhibited similar trends. For several years preceding the 2007-2009 financial crisis, the corporations had high optimal debt ratios. For most of the firms, about a year or two years prior to 2007, the optimal debt ratios began to drop. The decline was severe in all the cases. The trend of actual debt exceeding the optimal debt reversed post-GFC for most industries in the sample. We also calculate each company's actual debt ratio. Prior to the GFC, the data points to a rising actual debt ratio in the years prior to the GFC. Notably, after 2009, the actual debt levels across the airline, auto and energy industries remained stable, while the trend in the financial, pharmaceutical and technology industries continued to rise, pushing up leveraging.



For the Airline industry, actual debt level decreased after 2008 and remained at a low level since then, even though optimal level revealed a higher possibility of borrowing. For the Auto industry, actual debt level remained stable after 2009, but with actual debt always increasing optimal debt. This can tell us that the industry overall had excess debt, which increases the instability risk. The Energy industry exhibited a slightly different behavior. The companies were not excessively leveraged as the graphs show. The optimal debt level was much higher than the actual debt level until 2008. Afterwards, there was some ups and downs with a low debt level between 2012 and 2014. The Financial industry exhibited a continuously increasing level of actual debt, but the levels were still close to the optimal debt level, as opposed to the decade before the GFC. The companies in the financial industry decreased excessive risk between 2010 and 2013 to engage in risky borrowing again afterwards. Optimal-debt ratio was high during the years prior to the GFC and then decreased around 2006. Some other examples of select industries estimates of actual and optimal debt are shown in Figure 3.

Figure 3: Actual Versus Optimal Debt



## Conclusions

The optimal debt ratio estimation presented in this paper allows corporations to determine a sustainable debt level above which it becomes risky to leverage. The results of the paper raise some policy implications helpful to improving the performance of the modern financialized industries. Our model's empirical application suggests an opportunity to reduce overall risky debt by developing an optimal-debt structure that helps minimize financial instability and default within possible combinations of policy framework. Overall, our results are reminiscent of the observations of the classical writers Michal Kalecki and Hyman Minsky about the speculative cyclical transformations of the modern financialized economy.

## Select References

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