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A Spread-Based Measure of Household Financial Stress

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This brief proposes a spread-based measure of household financial stress. The measure, called the Household Financial Stress Measure (HFSM), differentiates the effects of household stress due to financial versus non-financial factors. The HFSM explains more variation in household delinquency rates than other commonly used measures, and the magnitudes are economically significant. Analysis indicates that the measure corresponds with various macroeconomic indicators, such as GDP growth and corporate bond yield spreads.

The resilience of household balance sheets to adverse shocks has implications for economic and financial stability. The magnitude of household exposures to financial institutions creates links between the real economy and the financial system that provide feedback between the two. Household financial factors have been important in the propagation of shocks to and from the financial sector. For example, during the run-up to the 2007-09 financial crisis, loose lending standards increased the household sector's debt levels and worsened fragilities in household balance sheets. More recently, shocks, such as the COVID-19 pandemic and the proceeding inflationary pressures, tested the resilience of the household sector, highlighting the need for sharper indicators of household stress.

This brief presents a unified measure, called the Household Financial Stress Measure (HFSM), that uses a variety of indicators to monitor household stress. The HFSM uses financial and non-financial factors to more accurately monitor household stress. Distinguishing these sources has implications for financial and economic stability, as documented by studies showing that financial factors magnify the transmission of aggregate shocks.[2] For example, the severity and duration of the 2007-09 financial crisis is often attributed to household financial factors. The recessionary conditions persisted after many macroeconomic indicators suggested recovery.

The brief has three main takeaways. First, the HFSM better explains household delinquency rates than other measures, such as household leverage and local unemployment rates, and the magnitudes are economically meaningful. Specifically, as of December 2022, delinquency rates for households more affected by financial stress are 2.4% higher than those that are less affected. This sizable margin represents 92% of the 2.6% aggregate delinquency rate.

Second, the HFSM is correlated with traditional household stress indicators, such as aggregate delinquency rates, during some periods but diverges in others. For example, the HFSM rises sharply during the 2007-09 financial crisis before declining throughout the 2010s. The measure does begin to diverge from other measures just before the COVID-19 pandemic. As of January 2023, the measure is higher relative to the post-2009 period. This suggests heightened financial

fragility on household balance sheets that may go beyond the effects of current economic conditions. However, the measure remains lower than its levels during the 2007-09 financial crisis.

Third, the relationship between the HFSM and general macroeconomic indicators implies that financial factors magnify general economic shocks. The measure is correlated with several macroeconomic indicators and reflects the relationship between household financial stress and economic conditions.

Identifying Household Financial Stress

We develop a methodology that determines which households are more likely to experience stress from financial factors rather than general macroeconomic factors, all things being equal. Once determined, the HFSM is the spread, or difference, between the delinquency rates calculated for households that are more likely to have financial stress and those that are less likely.

We argue that this spread isolates household stress due to financial factors. All households are assumed similarly affected by general economic shocks. How these shocks affect household balance sheets may depend on financial factors, including household leverage and credit access. These factors may magnify the effects of general aggregate shocks. Thus, delinquency rates should be higher for households more adversely affected by financial factors. Also, the spread between delinquency rates for each group should capture those components that magnify the broader shocks. The HFSM removes the common component related to non-financial factors and only reflects the component related to financial factors in the household sector. Likewise, the non-financial measure is the common component or the delinquency rate for households less likely affected by financial factors.

The appendix includes details about the full methodology. A critical step is identifying households more likely to experience stress from financial factors, differentiating the effects of non-financial factors, and understanding the interactions between the two factors.

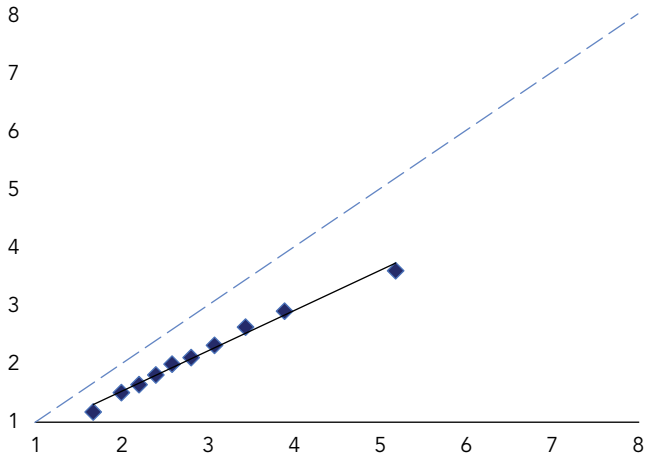
We offer a straightforward solution by constructing a model to estimate the relationship between delinquency rates and financial factors using data from the 2007-09 financial crisis. During other parts of the economic cycle, distinguishing the effect of household financial factors, such as financial leverage, from non-financial factors on delinquency rates is difficult and leads to imprecise measurements. The 2007-09 financial crisis provides an ideal laboratory to more accurately estimate the relationship given the importance of financial factors in explaining household conditions.

Household Financial versus Non-Financial Stress

We use the HFSM to examine current household financial conditions and their changes over time. We also calculate non-financial household stress for comparison purposes.

We start by describing current household financial stress based on households that are more and less likely affected by financial factors. **Figure 1** displays realized delinquency rates based on the mean predicted delinquency rates as of December 2022. The predicted and realized delinquencies do not have a one-to-one correspondence, though the relationship remains positive. Households expected to be riskier based on the model

Figure 1. Predicted Versus Realized Delinquency Rates (percent)



Note: Data as of December 2022. Counties are grouped into deciles based on predicted delinquency rates. The x-axis corresponds to the mean predicted value within a decile. The y-axis shows the mean realized delinquency rate for each decile. The dashed line represents a 45-degree line.

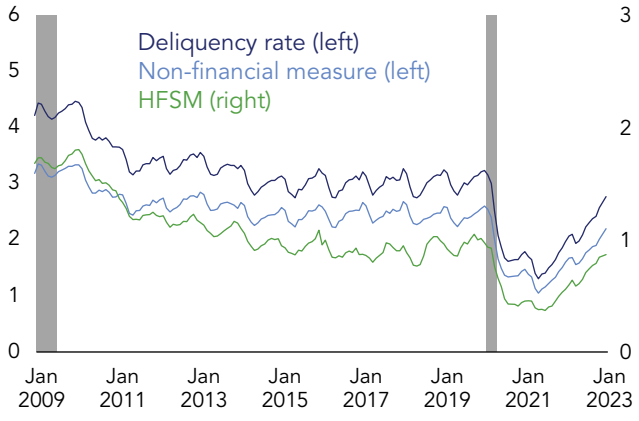
Sources: Equifax, Author's analysis

(top decile) have a realized delinquency rate of approximately 3.6% versus approximately 1.2% for those expected to be less risky (bottom decile). The 2.4% difference between the rates is economically meaningful given the delinquency rates during this period. Finally, realized delinquencies may be lower than predicted delinquencies partly from current economic conditions. As such, the realized delinquencies should be closer to the 45-degree line in Figure 1 during periods of greater aggregate stress.

We next consider if changes in the spread over time correspond with periods associated with household stress. We focus on the delinquency rate, the HFSM, and the non-financial measure (see **Figure 2**). The delinquency rates of the high-risk group are greater than those of the low-risk group, which results in a positive HFSM across the entire sample period. Also, the HFSM levels closely track the non-financial measure. This is consistent with the idea that financial stress amplifies general economic stress. Even though the methodology is based on data from the 2007-09 financial crisis, meaningful variation in the HFSM over time corresponds with periods associated with household financial stress after the crisis. Finally, the HFSM along with aggregate delinquency rates and the non-financial stress measure reached its nadir during the COVID-19 pandemic relative to the full sample period. While the three measures have steadily increased since, they remain below levels before the COVID-19 pandemic. These higher household financial stress levels are still lower than historical levels.

We also consider how the results differ across household loan products. After the 2007-09 financial crisis, borrower composition is very different for mortgages relative to bank cards and auto loans. Tighter lending standards for mortgages after the 2007-09 financial crisis imply a downward trend in delinquency rates that may not reflect overall financial stress. The HFSM based on these loan types is less likely to be informative for our purposes. **Figures 3 and 4** display the results for bank cards and auto loans, respectively.

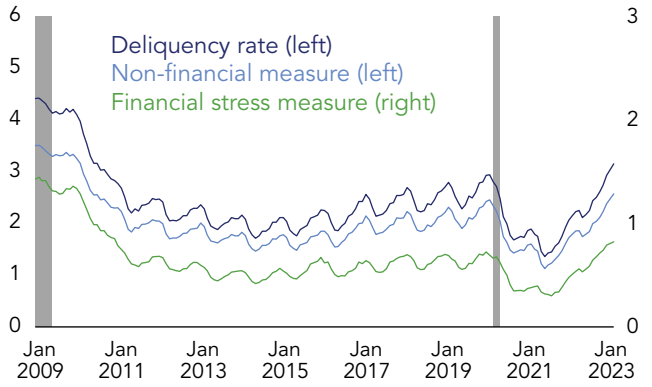
Figure 2. Aggregate Spread Measures (percent)



Note: Data as of January 2023. Shaded regions are recession periods.

Sources: Equifax, Author's analysis

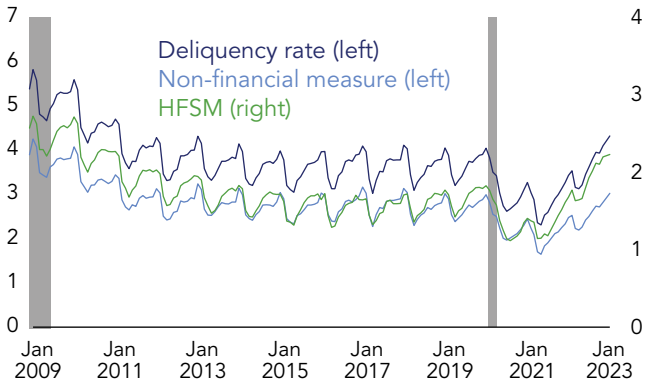
Figure 3. Bank Card Measures (percent)



Note: Data as of January 2023. Shaded regions represent recessionary periods .

Sources: Equifax, Author's analysis

Figure 4. Auto Measures (percent)



Note: Data as of January 2023. Shaded regions represent recessionary periods.

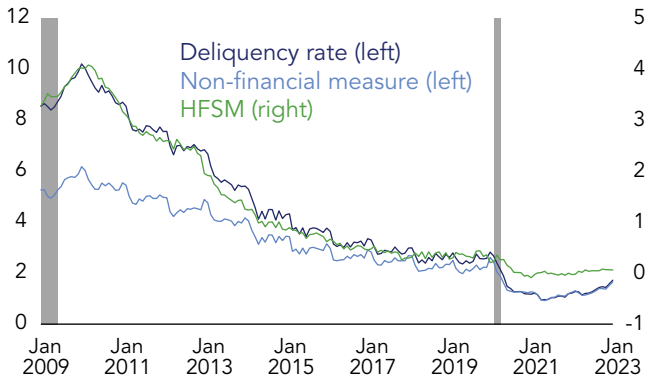
Sources: Equifax, Author's analysis

Both figures display similar procyclical movements starting in early 2011 along with aggregate measures. However, the HFSM is currently at its highest level for these loan types since the 2007-09 financial crisis. For loan products that better represent weaker credits, the measure shows relatively elevated stress levels.

We next examine the spread for mortgages and home equity lines of credit (HELOCs). The HFSM for these products behaves differently than for bank cards and auto loans (see **Figures 5 and 6**). Mortgage and HELOC delinquency rates have declined substantially from their respective peaks of 10% and 7% in early 2009 to approximately 2% in December 2022. Similarly, the spread-based measures mirror peak declines over the same periods. The spreads for these categories have converged to very low levels and become negative for mortgages. These remained virtually unchanged during the past decade. These patterns are likely driven by shifts in borrower compositions to safer households from more stringent lending standards and reforms after the 2007-09 financial crisis. These regulatory changes confound the mortgage- and HELOC-based spread's interpretation as a financial stress indicator. As a result, we use the prior product stress measures to proxy financial stress instead.

To assess the robustness of our spread-based measures, we consider what drives the variation in other spread measures. We calculate analogous measures based on household leverage, non-prime indicators, local unemployment rates, and local inflation rates. Individually, these alternative spread measures behave differently and have noise. For example, the relationship between delinquency rates and some of the individual characteristics is not monotonic, suggesting that combining factors identifies housing financial stress more so than the individual measures.

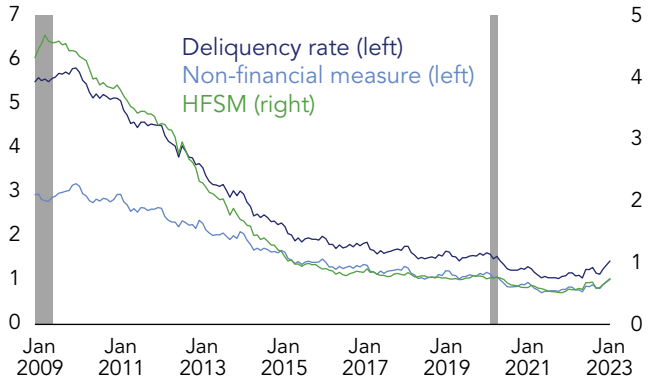
Figure 5. Mortgage Measures (percent)



Note: Data as of January 2023. Shaded regions represent recessionary periods.

Sources: Equifax, Author's analysis

Figure 6. HELOC Measures (percent)



Note: Data as of January 2023. Shaded regions are recession periods.

Sources: Equifax, Author's analysis

Relationship with Macroeconomic Conditions

We next analyze the behavior of the measures over time in relation to the same economic indicators considered in the first section. In particular, how are correlations different for the HFSM compared to the non-financial stress measure?

The measure is highly procyclical (see **Figure 3**). While the spread's spike during the 2007-09 financial crisis is driven by construction, the subsequent behavior is not. The measure reaches its lowest level during the sample period from the second half of 2020 through the end of 2021, which corresponds with the behavior of most of the economic indicators. Interestingly, the non-financial stress measure reaches a post-crisis high in early 2020. While the spread is also elevated, the behavior is muted in comparison.

Next, we directly compare the HFSM and non-financial stress measures to various economic indicators. The correlations for the HFSM are comparable to and

sometimes higher than the correlations for the non-financial stress measure (see **Figure 7)**.[3] These results suggest that the HFSM has a similar correlation structure with macroeconomic indicators despite capturing different information. Namely, macroeconomic shocks affect households, and the spread measure already differentiates these.

Figure 7. Bankcard Delinquency Measures and Economic Indicator Correlations

	Non-Financial Stress Measure	Financial Stress Measure
CAY	0.35	0.43
DEF	0.59	0.64
DIV	0.60	0.63
EGDP	-0.44	-0.39
RGDP	-0.14	-0.14
TERM	0.31	0.43

Note: Data as of January 2023. Non-financial stress measure proxies delinquencies incurred largely by non-financial factors. Financial stress measure proxies delinquencies incurred largely by financial factors.

Sources: Equifax, FRED, The Federal Reserve Bank of Philadelphia, Lettau and Ludvigson (2001), Bloomberg Finance L.P., Authors' analysis

Conclusion

This brief describes current household financial vulnerabilities using a new methodology that more directly identifies household financial stress. The methodology identifies household financial stress that may be distinct from general economic shocks. We show that household financial stress is at elevated levels relative to the post-crisis period. However, it remains far lower than its crisis levels. Our analysis also suggests a high correspondence of the measure with various macroeconomic indicators, suggesting a direct link between household financial stress and macroeconomic conditions.

Appendix

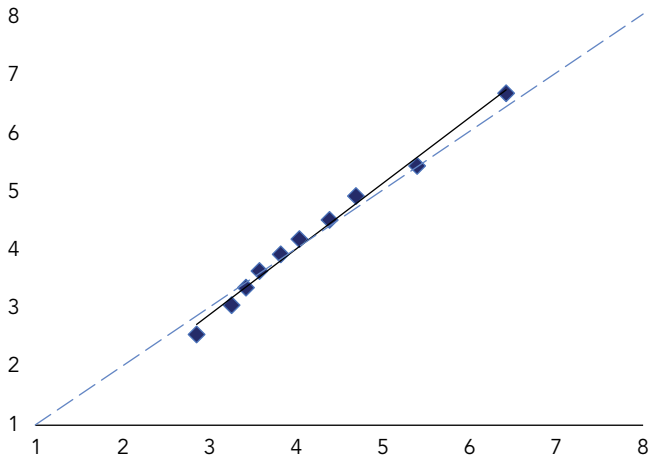
This section describes the methodology used to construct the HFSM. We start by focusing on a period where financial factors played a significant role in determining financial stress: the 2007-09 financial crisis. Using this period, we learn which delinquencies are more likely driven by financial factors. We estimate a regression model to explain delinquencies based on a large set of financial factors. Once estimated, the fitted model predicts whether a household is more likely to experience financial stress after the 2007-09 financial crisis.

By using county-level data on household outcomes, financial factors, and economic factors, we can make comparisons across counties for the same period. The financial factors include household financial leverage and non-prime household indicators. We also include other factors to assess the conditional importance of financial factors. This includes local economic factors, such as unemployment and poverty rates, and median household incomes. We also include other local factors that may correspond with persistent, structural factors: metropolitan region indicator, the overall size of the local labor force, local educational attainment, the local minority fraction, the composition of nontradable industries in the local economy, and the concentration of local industries. Note that the model is estimated on cross-sectional data, allowing us to focus on variation that is orthogonal to aggregate conditions.

To determine whether the approach is effective, we compare actual delinquencies during the 2007-09 financial crisis to the model's predictions (see **Figure A**). Its high degree of correspondence indicates that the model more accurately predicts financial stress. There is a one-to-one correspondence between the predicted delinquency rates and the actual delinquency rates. In other words, households with a predicted 5% delinquency rate during the 2007-09 financial crisis experienced a 5% delinquency rate.

We also examine whether the model's accuracy is from financial or economic factors. We re-estimate the regression model but recursively include different sets of factors. The financial factors alone account for more than 90% of the model's accuracy. This finding validates the model's ability to capture household financial stress and confirms the importance of financial factors in explaining delinquency rates during the 2007-09 financial crisis.

Figure A. Predicted Versus Realized Delinquency Rates (percent)



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Sources: Equifax, Author's analysis

Endnotes

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2 For example, see Michael Kumhof, Romain Rancière, and Pablo Winant, "Inequality, Leverage, and Crises," *American Economic Review* 105, no. 3 (2015): 1217-1245, https://www.aeaweb.org/articles?id=10.1257/aer.20110683; Enrique G. Mendoza, "Sudden Stops, Financial Crises, and Leverage," *American Economic Review* 100, no. 5 (2010): 1941-1966, https://www.aeaweb.org/articles?id=10.1257/aer.100.5.1941; and Moritz Schularick and Alan M. Taylor, "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises," *American Economic Review* 102, no. 2 (2012): 1029-1061, https://www.aeaweb.org/articles?id=10.1257/aer.102.2.1029.

3 CAY is in reference to the consumption-wealth ratio discussed in Martin Lettau and Sydney Ludvigson, "Consumption, Aggregate Wealth, and Expected Stock Returns," *Journal of Finance* 56, no. 2 (2001): 815-849, https://onlinelibrary.wiley.com/doi/10.1111/0022-1082.00347. CAY data is sourced from: https://sites.google.com/view/martinlettau/data.