



Do stock market trading activities forecast recessions? ☆

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ABSTRACT

This paper re-examines the existing recession forecasting models with stock market liquidity as an additional forecasting variable. We investigate three distinct aspects of stock market trading activities, namely stock market liquidity, returns and volatility as predictors of U.S. recessions. We also conduct a horserace comparison in the recession forecasting power between various stock market liquidity measures. We show that i) lower stock market liquidity signals recessions; ii) stock market liquidity (returns) forecasts recessions up to three quarters (two quarters) into the future, while stock market volatility has no forecasting power; iii) stock market liquidity as computed by stock transaction costs and by stock price changes to trading volume forecast recessions better than other measures in the literature; iv) stock market liquidity-based models outperform the survey of professional forecasters' estimates of recession probabilities, and hence the results suggest that professional forecasters may need to incorporate stock market liquidity in their forecasts. The results have potential preemptive monetary policy implications.

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1. Introduction

Accurately predicting the onset of recessions is important for households, investors, businesses and policymakers. Prior research indicates that economic and financial variables have significant forecasting power for U.S. recessions; Estrella and Hardouvelis (1991) show that the Treasury term-spread (the difference in yields on 10-year and 3-months Treasuries) contains information about the National Bureau of Economic Research (NBER) recessions for horizons up to eight quarters into the future. Estrella and Mishkin (1996, 1998) further investigate a broad range of macroeconomic and financial variables, such as real GDP growth, stock market returns and volatility as recession forecasting variables. Their results suggest that stock market returns are important short-term leading indicator of recessions. However, those studies do

not consider stock market liquidity as a recession forecasting variable. Erdogan et al. (2015) consider the Treasury term-spread and two stock market macro liquidity deviation measures as indicators of NBER recessions and find that stock market macro liquidity deviations forecast recessions one quarter into the future. However, the authors do not investigate the recession forecasting power of stock market returns and volatility. Since stock market returns, volatility and liquidity are three different, yet related, aspects of stock trading activities, it is common in the market microstructure literature to investigate the joint dynamics of those three variables (e.g., Chordia et al., 2001). Therefore, a comprehensive study on the combined role of stock market returns, liquidity, and volatility as predictors of recessions, to our knowledge, does not exist.

This study fills this important gap in the literature by investigating the relationship between NBER recessions and stock market trading activities as captured by stock market returns, volatility and liquidity. We conduct a comprehensive investigation on the existing recession-predicting models and variables, where the uniqueness lies in considering various stock market variables. We use seven widely employed stock market liquidity measures in the literature (e.g., Pastor and Stambaugh, 2003; Johnson, 2008; Næs et al., 2011; Erdogan et al., 2015) and conduct a horserace comparison in the

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recession forecasting power between various stock market liquidity measures.¹ Following the literature (e.g., Estrella and Mishkin, 1996, 1998), we further use the Treasury term-spread, stock market returns, volatility, and real GDP growth as additional forecasting variables.

Our results show that stock market liquidity contains information about the onset of the 2007–2009 recession as well as others dating back to the 1950s. The results suggest that, when stocks market liquidity falls, the probability of an economic contraction rises. We also show that stock market liquidity starts declining approximately three quarters prior to recessions and continues to do so until the onset of recessions. We further find that the information content of the Treasury term-spread and stock market liquidity complement each other during the period leading up to recessions. We show that the models with stock market liquidity and the term-spread as two forecasting variables have Pseudo R-squared values of approximately 24%, 33%, and 40% for one to three quarters forecast horizons, respectively. By contrast, for the same forecast horizons, the benchmark term-spread model has Pseudo R-squared values of approximately 7%, 19%, and 28%, while those for the parsimonious stock market liquidity only model are approximately 16%, 19% and 9%. Importantly, the results suggest that stock market returns, but not volatility, are important predictor of recessions for up to three quarters forecast horizons. We further show that real GDP growth forecast recessions one quarter ahead if we control for stock market variables and the finding is not surprising since real GDP growth must have information about recessions.

Our out-of-sample results confirm the in-sample findings that stock market liquidity improves the model performance whether stock market liquidity is included in the benchmark term-spread model or in the extended models that augment the benchmark model with stock market returns and real GDP growth for up to three quarters forecast horizons. The out-of-sample results further show that the stock market liquidity-augmented term-spread models have higher predictive accuracies than that of the Survey of Professional Forecasters' (SPF, hereafter) estimates of recession probabilities.

Based on both the in-sample and out-of-sample results, this paper provides new evidence that stock market liquidity contains information about future recessions that is not captured by other known forecasting variables. We further find that stock market liquidity as computed by stock bid-ask spreads or Pastor and Stambaugh's (2003) or Amihud's (2002) measures of stock liquidity forecast recessions better than other measures in the literature. The in-sample and out-of-sample results further show that, among the aforementioned three measures, Pastor and Stambaugh's (2003) stock market liquidity measure is possibly the best augmenting variable to the existing recession forecasting models that includes the Treasury term-spread, stock market returns and real GDP growth.

Our vector-autoregression (VAR) results further show that a stock market illiquidity shock in the current quarter significantly decreases

next-quarter real GDP growth.² Thus, the VAR results complement our main findings that stock market illiquidity forecasts economic contractions.³

We add to the existing recession forecasting models (e.g., Estrella and Hardouvelis, 1991; and Estrella and Mishkin, 1996, 1998) by showing that the performance of those models can be improved by incorporating stock market liquidity as an additional forecasting variable. We further show that stock market macro liquidity deviations (Erdogan et al., 2015) may not entirely capture stock market liquidity since stock market returns and real GDP growth explain a considerable portion of those macro measures of stock market liquidity. Importantly, we show that stock market macro liquidity deviations contain limited information about future recessions if we control for factors such as stock market variables and real GDP growth. Finally, our results complement the findings of the existing literature (e.g., Næs et al., 2011) that shows stock market liquidity predicts real GDP growth.

There are several mechanisms through which the observed relationship between stock market liquidity and recessions can take place. *First*, it is argued in the literature that investors rebalance their portfolio before recessions from riskier assets to less risky assets, thereby exacerbating the overall downward shift in the aggregate liquidity of the market (see, e.g., Longstaff, 2004). Our results reinforce the portfolio rebalancing argument by showing that stock market becomes illiquid (lower demand for stocks) and that the Treasury term-spread turns flat or downward sloping (higher demand for the Treasuries) prior to economic contractions.⁴

Second, stock market liquidity may cause changes in the real economy through the investment channel. The literature (e.g., Bernanke, 1983; Antonakakis and Badinger, 2016) shows that output volatility raises economic uncertainty and impedes investment, which in turn lowers economic growth. This paper argues that economic uncertainty may occur when the stock market is less liquid, thereby lowering investment. Thus, our results strengthen the view of the existing literature (e.g., Levine, 1991; Bencivenga et al., 1995; Levine and Zervos, 1998) that contends that a liquid secondary market allows investors to participate in productive long-term projects.

Third, since stock prices reflect the present value of future earnings, the forward-looking stock prices must reflect future earnings growth potential as argued in the literature (e.g., Næs et al., 2011). As a direct consequence, stock returns, volatility and liquidity may contain information about the real economy including recessions. However, we show that stock market returns and liquidity are the only robust predictors of recessions.

Our findings have considerable monetary policy implications. A flat or inverted yield curve is associated with a credit tightening since yields on the short-term Treasuries are anchored by monetary policy. Policymakers may need feedback on the efficacy of the contractionary monetary policy in addition to activities observed in the Treasury bond market. The stock market seems to be a natural place to evaluate the effect of monetary policy since Bernanke and Kuttner (2005), among others, argue that monetary policy shocks are transferred to the stock market. Our results suggest that stock trading activities are

¹ Stock market liquidity is an equally weighted cross-sectional average of the following liquidity measures of virtually all stocks in the NYSE (New York Stock Exchange): 1) transaction costs as computed by bid-ask spreads; 2) impact of dollar trading volume, which is the number of trades in a given day multiplied by stock closing price on that day, on stock prices – Amihud (Amihud, 2002) measure of stock illiquidity; 3) impact of dollar trading volume on stock returns after controlling for excess returns of stocks relative to market – Pastor and Stambaugh's (2003) measure of stock liquidity; 4) dollar trading volume; 5) turnover ratio: the number of shares traded relative to the number of shares outstanding. In addition, following the literature (e.g., Levine and Zervos 1998; Erdogan, Bennett and Ozyildirim 2015) we further use two macro liquidity measures: a) stock market depth: the ratio of stock market capitalization to GDP; b) macro liquidity deviations: the difference between the ratios of stock market dollar trading volume to GDP and stock market capitalization to GDP.

² For one standard-deviation Cholesky impulses and depending on the ordering of the variables, the impact ranges from approximately 0.16 percentage point (or 20% of the mean GDP growth of 0.8% per quarter) to 0.23 percentage point (or 28% of the mean GDP growth). For one standard-deviation Generalized impulse (Pesaran and Shin, 1998), which does not depend on the ordering of the variables, stock market liquidity reduces real GDP growth by approximately 0.29 percentage point (or 35% of the mean GDP growth).

³ We thank an anonymous referee for suggesting this important analysis.

⁴ The literature (e.g., Erdogan, Bennett and Ozyildirim 2015) argues that flattening of the yield curve is associated with lower yields on the long-term Treasuries, since the short-term Treasury yields are anchored by monetary policy. Alternatively, a flat or downward sloping yield curve implies higher demand for less risky assets.

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