Should Monetary Policy Monitor Risk Premiums in Financial Markets?

By Taeyoung Doh, Guangye Cao, and Daniel Molling

The recent financial crisis has reignited interest in whether monetary policy should respond to financial stability concerns such as asset price bubbles. Before the crisis, many believed monetary policy should respond to these concerns only to the extent they significantly alter the future outlook for inflation or unemployment. Proponents of this view regarded promoting financial stability by raising the cost of borrowing more than the outlook for inflation or unemployment warranted as undesirable because it might conflict with macroeconomic stability. However, the severity of the 2007-08 financial crisis and subsequent slow recovery challenged this view.

Recently, some policymakers have argued that monetary policy can and should play a more active role in preventing financial instability. Adjusting interest rates in response to risk premiums in financial markets could be an effective way to mitigate financial instability and the resulting macroeconomic instability. For example, if investors are underpricing adverse future outcomes, central banks could raise interest rates to increase the cost of risk-taking. Despite the importance of this suggested policy change, thorough investigations of the idea remain scarce.

Monitoring risk premiums might provide additional information about future macroeconomic outcomes that conventional indicators related to output and inflation do not typically reveal. As risk-averse

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investors become more or less concerned about relatively unlikely but potentially disastrous macroeconomic outcomes, risk premiums might change to reflect their perceptions. For example, a sudden spike in credit risk premiums could indicate an impending severe recession not evident from past and present macroeconomic indicators. Policymakers could mitigate the risk of a recession by choosing a more accommodative policy stance in response. On the other hand, unusually low risk premiums could reflect excessive risk-taking and call for a tighter monetary policy stance.

To reduce the probability of an adverse macroeconomic outcome, policy responses to risk premiums must meet two key conditions. First, for policymakers to have a chance to prevent a bad outcome, risk premiums must be useful in predicting future changes in economic growth. Second, monetary policy must be able to change risk premiums. If sudden shifts in risk premiums are predictable and monetary policy can affect them, then a policy stance more reactive to risk premiums could reduce the probability of a sharp decline in future macroeconomic activity. This article investigates whether risk premiums help predict future economic growth and whether monetary policy can affect risk premiums.

To assess predictability, a statistical analysis estimates the predictable portion of various risk premiums and real gross domestic product growth. The analysis indicates a prolonged period of low risk premiums can increase the probability of a severely adverse macroeconomic outcome, although the overall impact on expected future GDP growth is generally small.

Monetary policy could offset the adverse future economic effect of low risk premiums. A statistical analysis shows that an unexpected tightening of monetary policy increases risk premiums in the future. However, such policy tightening is expected to reduce GDP growth by raising the cost of borrowing and reducing aggregate spending. Thus, while a policy response to risk premiums could prevent an expected decline in future economic activity, it would come at the cost of lower economic activity in the near term.

Overall, the analysis suggests that if policymakers are concerned about tail risks such as the probability of a severely adverse macroeconomic outcome, adjusting short-term interest rates in response to various estimated risk premiums could be appropriate, especially if the risk premiums are low for a sustained period. In contrast, if policymakers are predominantly concerned about the most likely macroeconomic outcome, monitoring estimated risk premiums and adjusting the monetary policy stance accordingly may be of little benefit.

The first section of the article discusses how monitoring risk premiums might help prevent financial instability. The second section analyzes the predictability of future macroeconomic outcomes and estimated risk premiums as well as the response of risk premiums to the stance of monetary policy.

I. Financial Stability, Risk Premiums, and Monetary Policy

As the recent financial crisis has shown, asset booms and busts are important factors in macroeconomic fluctuations. Given that many central banks are mandated to stabilize macroeconomic volatility, a natural question is whether they should also respond to asset price volatility. The pre-crisis consensus view was that central banks should respond to changes in asset prices only to the extent they affect forecasts of macroeconomic objectives (Bernanke and Gertler). However, these forecasts typically focus on the most likely outcomes and ignore tail risks. As a result, most forecasters substantially underestimated the probability of the recent financial crisis and the severity of the subsequent recession.

Arguments against monetary policy responses to asset price movements

The standard theoretical argument that monetary policy should stabilize fluctuations in macroeconomic variables hinges on the idea that when prices are sticky—that is, slow to adjust—more productive firms are prevented from producing and selling more output by adjusting their prices when the aggregate inflation is fluctuating. By adjusting short-term interest rates, the central bank can reduce fluctuations in the aggregate inflation and reduce the negative effects of sticky prices on aggregate output. This argument for interest rate policy assumes perfect financial markets in which the risk of any macroeconomic state is correctly assessed and priced.[1] As a result, financial decisions by themselves are unlikely to generate any inefficiency in resource allocation.

Even if financial markets are assumed to be imperfect by introducing limits on external financing, agents in the economy can correctly price the risk of possible future macroeconomic outcomes in state-contingent contracts. Therefore, the risk premiums that arise from this financial friction fully reflect the social cost of borrowing and do not distort resource allocation.[2] Hence, this framework does not support a case for monetary policy affecting mispriced risk premiums.

In addition, the pre-crisis consensus view is based on the belief that while monetary policy may influence the level of aggregate demand, it does not contribute significantly to asset price booms and busts (Smets). The implication of this belief is that responding to indicators of aggregate demand is enough to stabilize the effect of volatile asset price movements on the real economy.[3] Furthermore, some researchers have argued that responding to asset prices rather than more conventional macroeconomic indicators of real activity can be less effective in inducing macroeconomic stability. For instance, Bernanke and Gertler suggest the central bank's response to stock price movements can generate more volatility in inflation than an aggressive response to inflation and output gap measures. Since movements in stock prices are often hard to justify by economic fundamentals, they are much noisier signals of the central bank's inflation and output objectives. Responding to noisier signals of those objectives makes them harder to achieve.

The pre-crisis consensus view does not rule out other policy tools to promote financial stability. Proponents often argue that regulatory approaches—for example, reducing the leverage in the financial system through capital requirements or restrictions on the liability side of financial intermediaries—might promote financial stability more effectively (Yellen).

Proponents of this view not only provided theoretical justifications but also empirical support: when the Internet stock bubble burst in the United States during the late 1990s, it did not majorly disrupt the economy (Fischer). However, the near meltdown of the financial system in the 2007-08 crisis and the subsequent slow recovery have seriously challenged this view.

Arguments for monetary policy responses to asset price movements

The alternative view that monetary policy can and should aim to reduce asset price volatility starts from the observation that financial market frictions can create inefficient credit booms and busts. Moreover, such inefficient booms and busts do not necessarily arise from the regulated financial sector, which limits the power of macroprudential regulation to prevent inefficient credit allocations. While financial market frictions can take various forms, a common theme is that asset prices may not guarantee the most efficient resource allocation in the economy. Borrowers (for example, entrepreneurs) may take more risk than socially desirable if frictional financial markets prevent them from fully internalizing the social cost of borrowing. For example, suppose borrowing is constrained by collateral requirements, so borrowers have to sell collateral during a bad macroeconomic state. Borrowers trying to liquidate their collateral to repay loans may not take into account the negative effects of their behavior on the net worth of others holding the same type of assets as collateral. This is often called a fire-sale externality and can result in inefficient overborrowing where borrowers underprice the social cost of their actions (Lorenzoni; Stein 2012). As a result, asset prices become more volatile.

Efficiency in such an environment could be improved in two ways. Although the conventional view would be to take a macroprudential approach—restricting borrowing against illiquid collateral—policymakers could consider asset price volatility in their decisions, setting the cost of borrowing to fully reflect the fire-sale externality during a liquidity crisis. When the overall risk of asset prices is likely underpriced, interest rate policy could be less accommodative. Risk premiums help determine if a risk is underpriced. When a risk premium is significantly lower than economic risk factors imply, a future drop in asset values is more likely. Such a sudden shift can have substantial negative effects on the economy.

Evaluating the arguments

The relative merit of each method crucially depends on whether policymakers can identify the source of potential vulnerability in the financial system. If inefficient credit booms and busts appear in certain sectors of the economy, a targeted approach limiting lending to these sectors might be more effective than using monetary policy to change the overall cost of borrowing. The recent financial crisis has shown that excessive leverage and reliance on short-term funding in the financial sector can lead to financial instability. If these factors are expected to be important in the future, setting regulatory limits on leverage and short-term funding as well as enhancing underwriting standards to prevent future crises might be more effective than adjusting the monetary policy stance.

However, predicting which sector will drive financial fragility in the future is difficult. The advantage of monetary policy in handling financial instability concerns is that it "gets in all of the cracks" (Stein 2014). While many are critical of using monetary policy to reduce asset price volatility because it is a "blunt tool" that affects the overall economy, such an approach might address financial instability concerns more effectively when the sources of future vulnerabilities are uncertain.

In addition, the pre-crisis consensus view assumes that macroeconomic stability pursued by monetary policy can be easily separated from financial stability pursued by regulations. This assumption is based on the belief that monetary policy, by altering the cost of borrowing, influences consumers' and businesses' decisions on current versus future spending. This line of thinking downplays the effect of monetary policy on financial intermediaries' risk-taking. In contrast, recent research on monetary policy transmission channels suggests a higher interest rate increases the market price of risk and induces financial intermediaries to shrink their balance sheets (Adrian and Shin). Such changes tend to precede a decrease in real activity in the future. Hence, it is difficult to separate financial instability concerns related to financial intermediaries' risk-taking from macroeconomic stability objectives.

A key challenge in using monetary policy to target financial instability concerns is gauging shifts in the market price of risk that require attention. A few candidates can act as credible indicators for the market price of risk. The next section discusses various measures of risk premiums as suitable indicators of shifts in the market price of risk.

II. An Empirical Analysis of Macroeconomic Outcomes, Risk Premiums, and Monetary Policy

Monetary policy influences the risk-taking of investors across a broad set of asset markets. As a result, any analysis of the market price of risk must include multiple risk premium measures. See the Box for a cautionary tale about what can happen when policymakers rely on a single risk premium measure.

Box

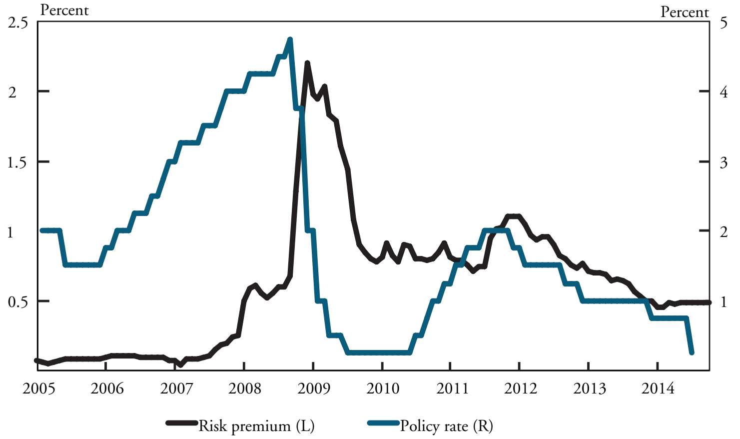
A Cautionary Tale from Sweden

In 2010 and 2011, Sweden's Riksbank raised its policy rate seven times, from near zero to 2 percent. Several members of the executive committee at the Riksbank cited rising housing prices and high household debt levels among the justifications for raising the policy rate even though inflationary pressures were perceived as low when the decision for the first rate hike occurred (minutes from the June 2010 monetary policy meeting). After the rate increases, house prices began to fall in late 2011, growth to households slowed, and inflation eventually fell well below 2 percent. However, GDP growth also began to slow, and the Riksbank eventually reversed all of its policy rate increases. This new decline in GDP growth was likely due in large part to the poor economic performance of the eurozone, Sweden's largest trading partner.

While this episode could be regarded as evidence against using monetary policy to address financial instability concerns, it is not inconsistent with the idea that monetary policy should respond to movements in broader measures of financial stability. In fact, corporate bond risk premiums in Sweden did not diverge much from economic fundamentals and only began to increase in 2011 after most of the policy rate increases took effect, as the chart on the next page shows.[4] Premiums continued to increase after the Riksbank halted its rate increases in August 2011. The Swedish experience suggests that monetary policy should consider broader measures of financial stability such as aggregate asset market risk premiums rather than leverage in the housing sector itself. A targeted macroprudential approach might be more effective if the goal is to contain excess in that particular sector.

Box continued

Sweden Corporate Bond Risk Premium and Target Policy Rate



Source: Sveriges Riksbank.

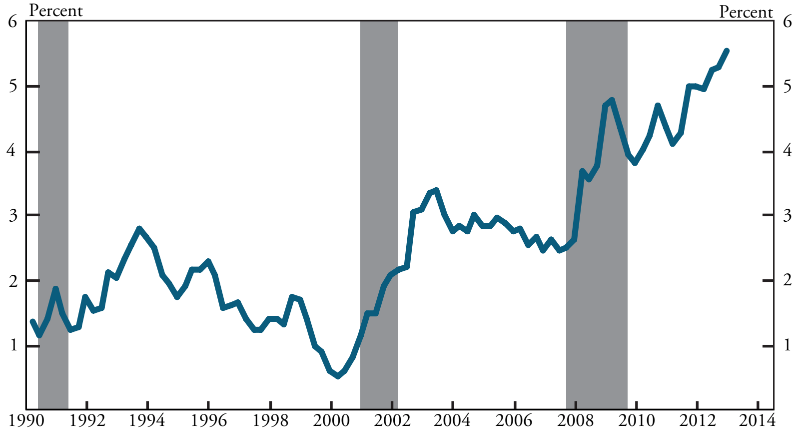
Risk premium measures

This article considers six risk premium measures. First, the article discusses measures of risk premiums from three different financial markets: the aggregate stock, bond, and derivative markets. The article then evaluates each premium's ability to predict one-year-ahead real GDP growth.

The first risk premium is the equity risk premium (ERP) that measures the additional compensation that investors demand for investing in stocks rather than bonds free from default risk. Chart 1 shows the empirical measure of the ERP from Duarte and Rosa since 1990. Next, three measures of risk premiums are obtained from bond market data. Chart 2 shows the historical evolution of a measure of the term premium (TP), the additional compensation for duration risk incurred by holding long-term Treasury bonds. Chart 3 shows two measures of the credit risk premium: the excess bond premium (EBP) and the macro risk premium (MRP). The EBP measures additional compensation for the default risk incurred by investing in corporate bonds above and beyond what can be explained by changes in the expected default probability. Similary, the MRP measures additional compensation for both the duration risk and the default risk above and beyond what can be explained by changes in the expected path of short-term risk-free rates and default probability. All these measures are generally countercyclical,

Chart 1

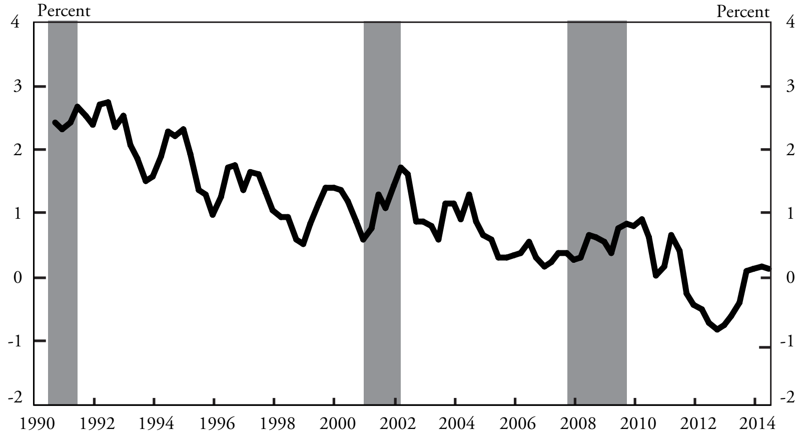
Equity Risk Premium



Note: Gray bars represent NBER-defined recessions.
Source: Duarte and Rosa.

Chart 2

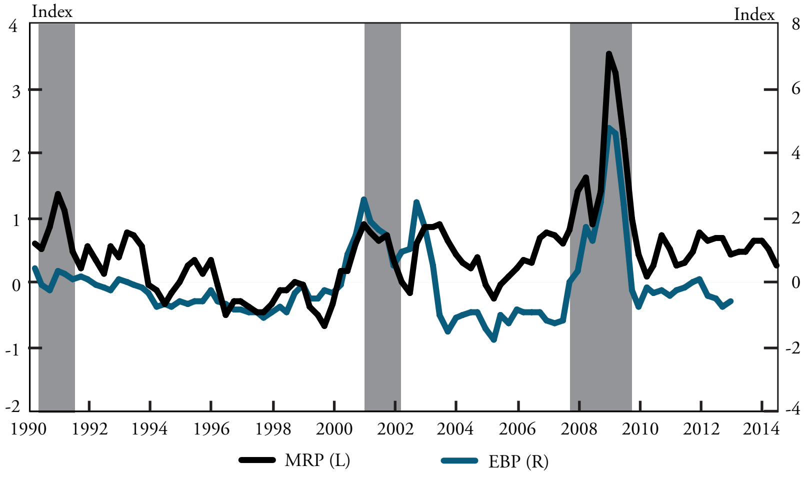
Term Premium



Note: Gray bars represent NBER-defined recessions.
Source: Kim and Wright; Federal Reserve Board.

Chart 3

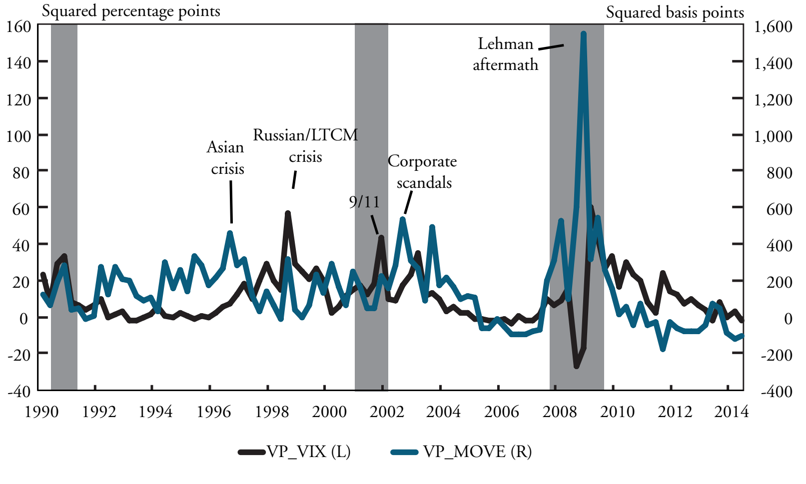
Macro Risk Premium and Excess Bond Premium



Note: Gray bars represent NBER-defined recessions.
Sources: Adrian, Moench, and Shin; Gilchrist and Zakrasjek.

Chart 4

Variance Premiums—VIX and MOVE



Note: Gray bars represents NBER-defined recessions.
Sources: Drechsler and Yaron; authors' calculations.

Table 1
Description of Risk Premium Measures

Measure	Description	Source
MRP	The component of credit and treasury yields that tracks GDP growth. Constructed as the predicted values of a regression of GDP on various corporate bond and treasury spreads.	Adrian, Moench, and Shin, 2010
EBP	The component of the spread between corporate bonds and treasuries that is not explained by firms' default risk.	Gilchrist and Zakrajsek, 2012
ERP	The expected return of stocks in excess of risk-free rate.	Duarte and Rosa, 2014
TP	The compensation demanded by investors for the uncertain return on holding a long-term bond.	Kim and Wright, 2005
VP_VIX	Difference between the squared Chicago Board Options Exchange Volatility Index (VIX) and expected realized variance of S&P 500 yields.	Drechsler and Yaron, 2011, and authors' calculations
VP_MOVE	Difference between the squared Merrill Option Volatility Estimate index (MOVE) and expected realized variance of Treasury yields.	Authors' calculations

rising during the recession periods identified by the National Bureau of Economic Research (NBER). The pattern is most pronounced in the ERP but also observed in the TP, EBP, and MRP.

Finally, two variance risk premium estimates (VP_VIX, VP_MOVE) from derivative markets measure the additional compensation for fluctuations in the return variance either in equity markets or Treasury bond markets. Chart 4 shows the historical evolution of the two variance risk premium estimates through past episodes of financial market turmoil. These variance risk premiums typically spike with major disruptions to financial markets, suggesting they are good proxies for the overall risk aversion of investors. Table 1 describes the risk premium measures used in the analysis, and the Appendix details how each risk premium measure is constructed.

From the perspective of financial stability, what is important is a shift in the overall market price of risk that can shift various risk premiums at the same time. To analyze the co-movement of these risk premiums, it is useful to look at their correlation matrix. The correlation matrix in Table 2 shows that the variance risk premium from equity options (VP_VIX) is nearly uncorrelated with risk premium measures other than the EBP. Additionally, the TP is more or less negatively correlated with all other risk premium measures. Unlike the VP_VIX, the VP_MOVE is positively correlated with the bond market risk premium estimates, suggesting that volatility and the level of bond returns might be positively correlated, on average. One notable pattern is that the

Table 2
Correlation Matrix of Risk Premiums

	MRP	EBP	ERP	TP	VP_VIX	VP_MOVE
MRP	1.000					
EBP	0.692	1.000				
ERP	0.442	0.148	1.000			
TP	-0.217	-0.030	-0.670	1.000		
VP_VIX	0.088	0.205	0.043	-0.098	1.000	
VP_MOVE	0.440	0.570	-0.009	0.206	-0.032	1.000

EBP is significantly correlated with two variance risk premiums which are more highly correlated with financial market turmoils than other risk premium measures.

Predictability of macroeconomic activity and risk premiums

The main criteria to judge whether monitoring a particular risk premium measure is worthwhile is whether or not the premium is predictable and provides information about the future economy beyond that provided by conventional macroeconomic indicators. As monetary policy typically influences the real economy with a lag, the current measure of the risk premium must provide information about the future risk premium. Without future information, any monetary policy response to the current estimate of a risk premium will be behind the curve in terms of effects on the real economy. Furthermore, fluctuations in the risk premium need to provide information about the future economy not revealed in the usual macro variables.

The estimated serial correlation coefficient provides a simple measure of a variable's predictability. Table 3 shows that all the risk premium estimates have moderate to high values of serial correlation with most of coefficients above 0.5. Specifically, risk premium estimates from stock and bond markets are highly persistent with serial correlation coefficients above 0.8 while risk premium estimates from derivatives markets are only moderately persistent. Thus, the risk premium measures pass the first criterion of predictability.

Researchers have found that information from a risk premium measure about the future economy depends on the current state of the economy. While an increase in the risk premium can be a

Table 3
First-Order Autocorrelation

Risk premiums	First-order autocorrelation
MRP	0.811
EBP	0.851
ERP	0.935
TP	0.902
VP_VIX	0.492
VP_MOVE	0.466

relatively good indicator of an economic downturn, a decrease in the risk premium may be a poor indicator of economic growth (Stein 2014). This asymmetry suggests that monetary policy may need to be less accommodative when responding to an exceptionally low risk premium than the pure macroeconomic outlook implies.[5] However, a less accommodative policy would do little damage to the near-term macroeconomic outlook because the exceptionally low risk premium does not typically generate a huge boom in aggregate demand. The unusually low risk premium may sow seeds for future financial instability and subsequent macroeconomic instability as investors underestimate the riskiness of assets to reach for yield.[6]

To evaluate the macroeconomic implications of changes in risk premiums, a statistical model relating real GDP growth one year ahead to the various measures of risk premiums is estimated. Lagged real GDP growth terms are also included in the regression to judge whether the financial indicators provide any additional predictive power beyond that from past GDP growth. Positive changes in risk premiums are included in the regression separately from negative changes to capture the apparent asymmetry in the relationship. The results are presented in Table 4. When only one risk premium measure is used as an explanatory variable in addition to three lags of real GDP growth, the model with the EBP has the highest explanatory power in terms of the adjusted R^2 statistic.[7] The effect of changes in the EBP on real GDP growth is asymmetric. For example, a 1-standard-deviation increase in the EBP (0.6 percentage point) decreases one-year-ahead real GDP growth by a statistically significant 1.74 percent (2.904×0.6) on average. But a decrease in the EBP by the same magnitude increases one-year-ahead real GDP growth by only 0.64 percent (1.065×0.6)—

Table 4

Regression of One-Year-Ahead Real GDP Growth onto Change in Risk Premiums

Explanatory variables	Forward real GDP					
Increase in the EBP	-2.904*** (0.607)					
Decrease in the EBP	-1.065 (0.680)					
Increase in the MRP		-1.324** (0.523)				
Decrease in the MRP		-1.015 (0.748)				
Increase in the VP_VIX			0.012 (0.014)			
Decrease in the VP_VIX			(0.019) (0.020)			
Increase in the TP				1.048 (0.960)		
Decrease in the TP				-0.264 (0.840)		
Increase in the VP_MOVE					-0.002** (0.001)	
Decrease in the VP_MOVE					-0.001 (0.002)	
Increase in the ERP						-1.873*** (0.653)
Decrease in the ERP						-0.219 (1.040)
First lag of real GDP	0.101* (0.051)	0.113** (0.053)	0.143** (0.060)	0.130** (0.056)	0.102 (0.063)	0.114** (0.055)
Second lag of real GDP	0.067 (0.057)	0.042 (0.057)	-0.017 (0.060)	-0.026 (0.057)	0.021 (0.059)	-0.017 (0.057)
Third lag of real GDP	0.029 (0.052)	0.048 (0.058)	0.033 (0.056)	0.032 (0.055)	0.001 (0.058)	0.028 (0.055)
Constant	1.751*** (0.265)	1.662*** (0.327)	1.626*** (0.263)	1.659*** (0.255)	1.871*** (0.276)	2.020*** (0.270)
Observations	89	89	88	89	88	89
Adjusted R^2	0.291	0.164	0.038	0.036	0.093	0.141

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.
Note: Robust standard errors are in parentheses.

not statistically significant. While several risk premium measures have statistically significant coefficients, once the EBP is included, other risk premium measures offer little additional information. In this sense, the

Table 5
Regression of Changes in the EBP on Lagged Risk Premiums

Explanatory variables	(1) D.EBP	(2) D.EBP	(3) D.EBP	(4) D.EBP	(5) D.EBP	(6) D.EBP
Lag EBP	-0.150 (0.099)	-0.108 (0.077)	-0.0936 (0.074)	-0.0824 (0.075)	-0.0343 (0.110)	-0.0586 (0.114)
Lag VP_VIX		-0.008** (0.004)	-0.008** (0.004)	-0.009** (0.004)	-0.009** (0.004)	-0.009** (0.004)
Lag ERP			-0.045* (0.023)	-0.0834** (0.034)	-0.069* (0.040)	-0.070* (0.040)
Lag TP				-0.078* (0.044)	-0.075 (0.046)	-0.084* (0.045)
Lag MRP					-0.067 (0.093)	-0.074 (0.093)
Lag VP_MOVE						0.000 (0.000)
Constant	-0.008 (0.033)	0.089* (0.053)	0.202*** (0.074)	0.392** (0.150)	0.385** (0.151)	0.377** (0.152)
Observations	92	91	91	89	89	89
Adjusted R^2	0.065	0.184	0.202	0.215	0.214	0.209

*** Significant at the 1 percent level.
** Significant at the 5 percent level.
* Significant at the 10 percent level.
Note: Robust standard errors are in parentheses.

EBP seems to be a sufficient statistic to monitor if the goal is to assess the near-term outlook for the macroeconomy.

This does not imply, however, that monitoring risk premium estimates other than the EBP is useless. Although these measures do not provide additional information on future economic activity once the EBP is included, they might be useful in predicting a spike in the EBP that could lead to a bad macroeconomic outcome. To investigate this possibility, the change in the EBP is regressed onto lagged risk premium estimates. The regression results in Table 5 suggest that positive changes in the EBP are more likely to happen when the level of the ERP, the TP, and the VP_VIX is negative. While we do not observe a negative equity risk premium during the sample period, the TP and the VP_VIX occasionally became negative. Together, the regression results in Tables 4 and 5 show that the ERP, the TP, and the VP_VIX have little information about future real GDP by themselves but provide additional information in predicting changes in the EBP. Therefore, ignoring fluctuations in these risk premium estimates solely based on the regression of real GDP growth can be misleading, especially if the goal is to detect the probability of a large spike in the EBP that could signal a severe recession.

Monetary policy and risk premiums

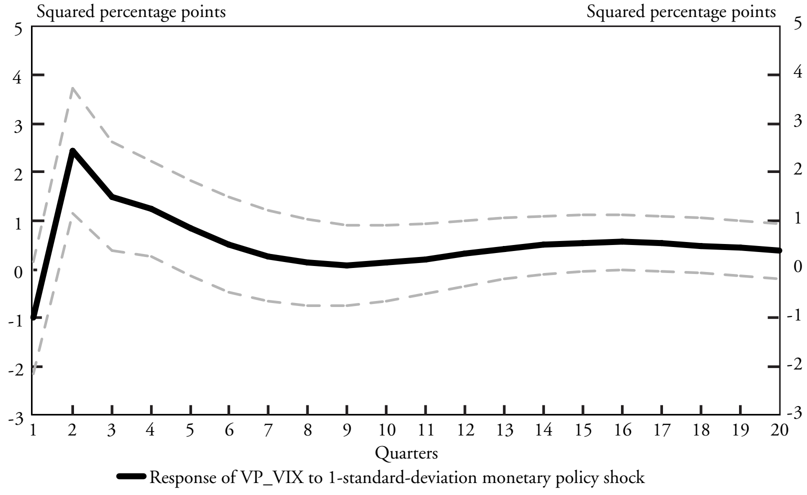
A remaining question for monetary policy makers is whether changes in the policy interest rate affect the magnitude of risk premiums. To answer this question, this section estimates a statistical model of the effect of a surprise change in the monetary policy stance on risk premiums. The model is a vector autoregression (VAR) including an indicator for the real economy, the real policy rate, the variance risk premium, and the forecast uncertainty of equity returns similar to Bekaert, Hoerova, and Lo Duca.[8]

The estimated response of the VP_VIX to a positive shock to the real federal funds rate suggests that tightening monetary policy above and beyond the level associated with business conditions and inflation leads to an increase in the VP_VIX in the subsequent period (Chart 5). The analysis focuses on the variance risk premium for several reasons. First, while an increase in the EBP predicts a decline in future real GDP growth, the past EBP is not a good predictor for the current EBP. Second, the VP_VIX becomes negative occasionally during the sample period and predicts the EBP in a statistically and economically significant way. The TP also shows these features, but the quantitative magnitude in terms of predicting future changes in the EBP is smaller than the VP_VIX. Combining the response of the VP_VIX to a positive monetary policy shock with previous findings that a lower variance risk premium predicts an increase in the EBP that leads to a decline in real GDP growth, the analysis suggests monetary policy could mitigate a sudden spike in the future corporate bond risk premium that could trigger macroeconomic instability.

To gauge the potential value of responding to risk premiums, a counterfactual exercise is performed using the regression results. Using only mean estimates from the regression analysis and assuming the level of the VP_VIX (-2.06) as of the second quarter of 2014 is unchanged for two years, the predicted negative impact of the negative variance risk premium on real GDP growth from 2016:Q2 to 2017:Q1 is about 0.38 percentage point.[9] Significant monetary policy tightening would be required to completely offset this effect.

Chart 5

Impulse Response Function of Quarterly Four-Variable VAR



Notes: Structural-form impulse response function for the four-variable VAR (business cycle, monetary policy, VP_VIX, forcast equity market return volatility). Dashed lines are 90 percent bootstrapped confidence intervals based on 1,000 replications with two lags.

Raising the variance risk premium from -2.06 to 0 for two years would require a surprise monetary policy tightening of about 0.7 percentage point in each of three consecutive quarters.[10] Given the dampening effect of such tightening on spending and thus real GDP growth, the macroeconomic benefit of promoting financial stability is relatively small. A one-percentage-point positive shock to the real funds rate is estimated to decrease real GDP growth by 0.3-0.4 percentage point for about one-and-a-half years (Kiley). Translated into the scale of this article's exercise, the required monetary policy tightening is expected to reduce one-year-ahead real GDP growth by 0.95-1.3 percentage points with a mean reduction of 1.1 percentage points. Thus, preventing a future decline in economic activity may come at a large output cost today.

However, if policymakers are concerned about the tail risks associated with low risk premiums, the perceived value of a policy response may be greater. Using the upper band of the 95 percent confidence intervals of the estimates in the statistical model to express policymakers' concern for tail risks, the same counterfactual exercise implies a 1.19-percentage-point decline in real GDP growth from 2016:Q2 to 2017:Q1. The cost of offsetting this risk remains the same as in the previous exercise. While the magnitude is not necessarily alarming, it is worthwhile to keep in mind that evaluating the tail risk by assuming a normal distribution of regression coefficients likely underestimates the negative effect of the low variance risk premium on future real GDP growth. Therefore, if policymakers are concerned about tail risks, a prolonged period of a negative variance risk premium could be a factor in monetary policy decisions.

III. Conclusion

The severe macroeconomic effects of the 2007-08 financial crisis challenged the pre-crisis consensus that monetary policy should focus on stabilizing inflation and real output rather than financial stability. While a targeted regulatory approach might be effective in addressing particular vulnerabilities within regulated institutions, it may be less effective when vulnerabilities shift to an unregulated sector.

This article examines whether monetary policy could more effectively respond to financial stability concerns such as fluctuations in bond market risk premiums. The empirical analysis shows that positive changes in the excess bond premium have substantially negative effects on future real GDP growth. In addition, changes in this risk premium are better predicted by monitoring the level of other estimated risk premiums, not just its own level. Together, the results suggest monitoring the level of a broad range of estimated risk premiums may be worthwhile. While current levels of risk premium estimates do not suggest an immediate change in monetary policy, a non-negligible tail risk could emerge if the VP_VIX drops further and stays negative for a prolonged period.

Appendix

Construction of Risk Premium Measures

This article considers six risk premium measures constructed from data on aggregate market returns on equity, Treasury bonds, corporate bonds, equity derivatives, and Treasury bond derivatives. Monthly data are available from January 1990 to December 2012, except for the macro risk premium, which is available from July 1990 to December 2012. All monthly observations are converted to quarterly data using the three-month average.

The equity risk premium (ERP) is from Duarte and Rosa, who construct a measure of the one-month-ahead expected excess return of equity over the risk-free rate by extracting the first principal component of 29 different measures of the ERP.

Three different risk premium measures are used to describe bond market risk premiums. The macro risk premium (MRP) is from Adrian, Moench, and Shin, who construct a weighted average of term spreads between long-term Treasury bond yields and short-term Treasury bond yields and corporate bond yield spreads over Treasury bond yields to track the current quarter real GDP growth. The term premium (TP) is from Kim and Wright, who estimate a no-arbitrage three-factor affine term structure model using U.S. Treasury bond yields data and decompose the ten-year Treasury yield into expected short-term interest rates and the TP. The excess bond premium (EBP) is from Gilchrist and Zakrajšek, who compute the portion of corporate bond yield spreads over Treasury yields that cannot be explained by the expected default probability.

Two variance risk premium measures are obtained from derivative markets on equity and Treasury bonds. Following Drechsler and Yaron, the variance risk premium for the equity market (VP_VIX) is computed as the difference between the squared Chicago Board Options Exchange Volatility Index (VIX), which measures the implied volatility of S&P 500 index options, and the fitted variance of S&P 500 index return by a statistical model with one autoregressive term and one moving average term. Carr and Wu show that we can replicate the payoff from the variance swap rate in which the contracted payoff depends on the difference between the pre-fixed variance swap rate and the realized return variance that is computed ex post by using out-of-money option prices. To prevent arbitrage opportunities in the swap contract, the variance swap rate should be equal to the risk-neutral expected value of the realized variance. Otherwise, by taking a long or a short position, an investor can take a positive profit with zero net investment. The risk-neutral expected value of the realized variance tends to be bigger than the expected value of the realized variance by a statistical model, implying that investors dislike fluctuations in return variance and are willing to pay a premium to fix variance ex ante by taking a long position in the swap contract.[11] The variance risk premium for the bond market (VP_MOVE) is similarly computed but uses the squared Merrill Lynch Option Volatility Estimate (MOVE) that computes a weighted average of implied volatilities of Treasury bond yields from various Treasury bond option prices instead of the VIX.

Endnotes

[1]Technically speaking, this assumption means that financial markets are complete. In other words, there exists a full set of state-contingent securities that pays off only when a particular state is realized in the future. When these securities are traded in frictionless financial markets, no-arbitrage conditions guarantee that risk-sharing is efficient in the sense that more risk-tolerant people bear more risks.

[2]Financial frictions will generate a less desirable outcome than an economy without such frictions. But conditional on the existence of frictions, the resource allocation is optimal and cannot be improved by available policy tools in the economy unless one introduces additional constraints on the resource allocation due to the zero lower bound on nominal interest rates or a fixed exchange rate (Farhi and Werning). The consideration of such additional constraints along with external borrowing constraints has been largely absent in predominant models before the crisis.

[3]Nonetheless, this view does not rule out short-term interventions to protect financial stability during liquidity crises (Bernanke and Gertler).

[4]This article's corporate bond risk premium data is from the Riksbank. A simple regression of Swedish risk premiums for corporate bonds on the growth rate of real GDP reveals a significant negative relationship, with high risk premiums relative to the pre-recession period. However, the risk premiums experienced essentially no change between late 2009 and mid-2010 when the first rate increases occurred.

[5]Of course, if investors anticipate the systematic response of monetary policy to low risk premiums, the historical relationship may be weakened.

[6]Chabot challenges the view that the low level of bond risk premium presages a future spike in the risk premium by looking at the TP, corporate bond spread, and EBP. Large increases in these three measures of bond risk premiums are found to be independent of the recent level or changes in risk premiums or the federal funds rate. The relatively high persistence of the three risk premium measures is consistent with that finding but the analysis does not consider other risk premium estimates as possible predictors.

[7]A lower R^2 implies a lower overall magnitude of residual errors. To compare models with different numbers of regressors, an adjusted R^2 is preferable because it increases only when an additional regressor improves the model fit more than by chance.

[8]The model this article uses to forecast return volatility is different from theirs in two ways. The percentage change in the industrial production index from a year ago is used as an indicator of real activity. The policy rate is measured as the effective federal funds rate deflated by the percentage change in the headline CPI from a year ago.

[9]The calculation combines the estimated effect of the level of the variance risk premium on the change in the EBP with the estimated effect of the change in the EBP on future real GDP growth. For simplicity, the second-order effect of

the variance risk premium on the future EBP through the lagged EBP is ignored. Quantitatively, that magnitude turns out to be small.

[10]This number can be calculated from the cumulative response of the variance risk premium to a 1-standard-deviation positive monetary policy shock.

[11]If investors take a long position in the swap, a positive payoff occurs only when the realized variance is bigger than the swap rate. By having a higher swap rate than the statistical expectation of the return variance, the investors are willing to pay a premium in order to have an ex ante fixed return variance. If the investors do not care about fluctuations in the return variance, they would set the variance swap rate equal to the statistical expectation of the return variance.

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