

Financial Stress and its Impact on Economic Activity: Evidence from Jamaica



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Outline

- ❖ Introduction (Background, Motivation and Contribution)
- ❖ Literature on Measuring Financial Stress
- ❖ Development of a Financial Stress Index for Jamaica (JFSI)
 - ❖ Composition of the Index
 - ❖ Variable Selection
 - ❖ Creating the Index
- ❖ JFSI Results
- ❖ Impact on Economic Activity
- ❖ Conclusion
- ❖ Policy Implications

Introduction

- The Jamaican economy has experienced periods of economic downturn that can possibly be attributed to financial stress.
- Financial stress can be defined as an interruption to the normal functioning of financial markets.
- Research in advanced economies has been geared toward developing several indices that can be utilized to capture the effect that financial stress can have on a country's economic activity.
- The index will be useful in:
 - Predicting historical episodes of financial stress by using data from the foreign exchange, money and equity markets.
 - Estimating the effect of financial stress on economic activity.

Literature on Measuring Financial Stress

- Cardarelli, Elekdag and Lall (2009)- Advanced Economies Financial Stress Index (AE_FSI)
 - Simple aggregated index.
 - The index was mainly driven by banking distress.
- Slingenberg and de Haan (2011)- OECD
 - Findings in line with Cardarelli et al. but the index had no predictive power.
- Illing and Liu (2006)- Canada
 - Used factor analysis through the method of principal components analysis to develop the index.
- Oet, Eiben, Branco, Gramlich and Ong (2011)- Cleveland
 - Found that the index acted as an EWS as the index had the ability to uncover distortions in the market.
- Mingione (2012)- Jamaica
 - Identified some periods of stress but showed other major periods as calm.

Development of a Financial Stress Index for Jamaica (JFSI)

- Based on previous studies, a FSI should be able to capture financial market disturbances that will potentially have an effect on economic activity.
- Consistent with the literature, the JFSI will utilize financial data from the equity, money, bond and foreign exchange markets.
- The FSI was constructed using monthly data from January 2005 to July 2013 and includes seven variables.
- The index will be created using three methods:
 - Simple aggregation
 - Principal Components Analysis (PCA)
 - Market weights

Composition of the Index

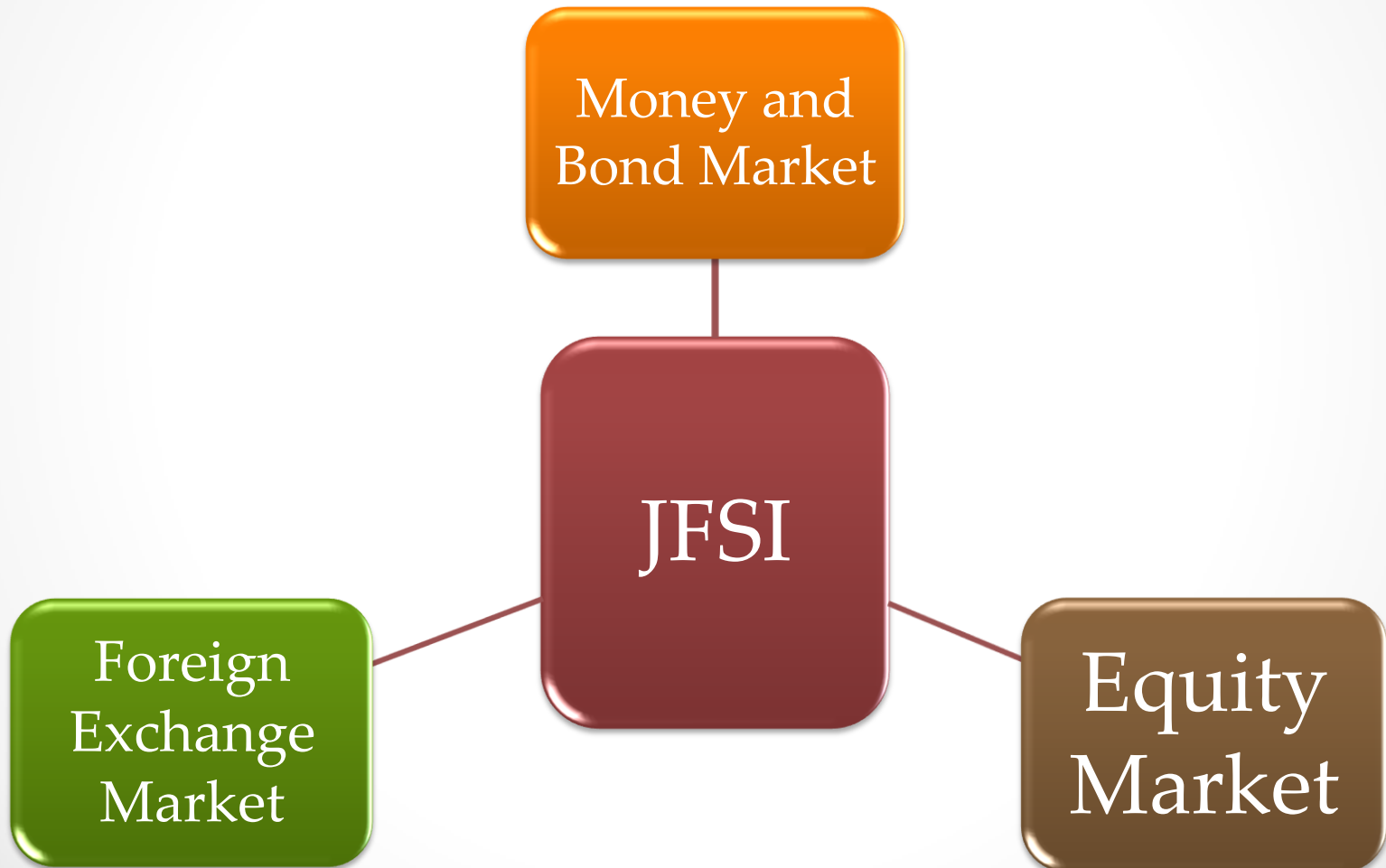


Table 1: Description and Sources of Variables Used for the Index

Sub-Index	Component	Variables Used	Description
Money and Bond Market	30-Day Spread	30 Day Private Money Market Rates	<p>This spread is the difference between the 30 day private money market rates and the yield on the 30 day Treasury Bill.</p> $30 - \text{Day Spread} = 30 \text{ Day PMMR} - 30 \text{ Day T} - \text{Bill}$
		30 Day T-Bill	<p>This is used to capture liquidity and counterparty risk.</p>
	Term Spread	Domestic 20 year Government Bond	<p>Otherwise called the slope of the yield curve, the term spread is the difference in short and long term government rates.</p> $TS = \text{GOJ Domestic 1 Year} - \text{GOJ Domestic 20 Years}$
		Domestic 1 year Government Bond	



Table 1: Description and Sources of Variables Used for the Index

Sub-Index	Component	Variables Used	Description
Equity Market	Financial Sector Beta	JSE Main Index	<p>The FSB uses the covariance of the year-on-year percentage change of the financial sector index and the JSE main index divided by the 2- month variance of the year-on-year percentage change in the JSE main index.</p> $\beta = \frac{\text{Cov}(x, y)}{\sqrt{\text{Var}(y)}}$
		Financial Sector Index	
	Stock Market Decline	JSE Main Index	$\text{Stock Decline} = - \left(\frac{\text{Index}_t - \text{Index}_{t-1}}{\text{Index}_{t-1}} \right)$
Stock Market Returns Volatility	JSE Main Index	<p>GARCH (1,1) volatility of the monthly percentage change of the stock market index.</p>	



Table 1: Description and Sources of Variables Used for the Index

Sub-Index	Component	Variables Used	Description
Foreign Exchange Market	Volatility of the Real Effective Exchange Rate	Real Effective Exchange Rate	GARCH (1,1) volatility of the monthly percentage change of the real effective exchange rate.

Creating the Index

❖ *Method 1: Aggregating the Index*

- $JFSI_{UNWEIGHTED} = FSB + REER + SMD + SMR + 30DayS + TermS$

❖ *Method 2: Principal Components Analysis*

- $JFSI_{PCA} =$
 $- 0.030FSB + 0.612REER + 0.0220SMD + 0.615SMR +$
 $0.388 * 30DayS - 0.216TermS$

❖ *Method 3: Market Weighting*

- $JFSI_{MARKETWEIGHTS} = 0.111FSB + 0.333REER + 0.111SMD +$
 $0.111SMR + 0.167 * 30DayS + 0.167TermS$




Interpreting the Index

- All three indexes were transformed to take a value between -1 and +1 by representing each value as a proportion of the maximum historical value of the index.

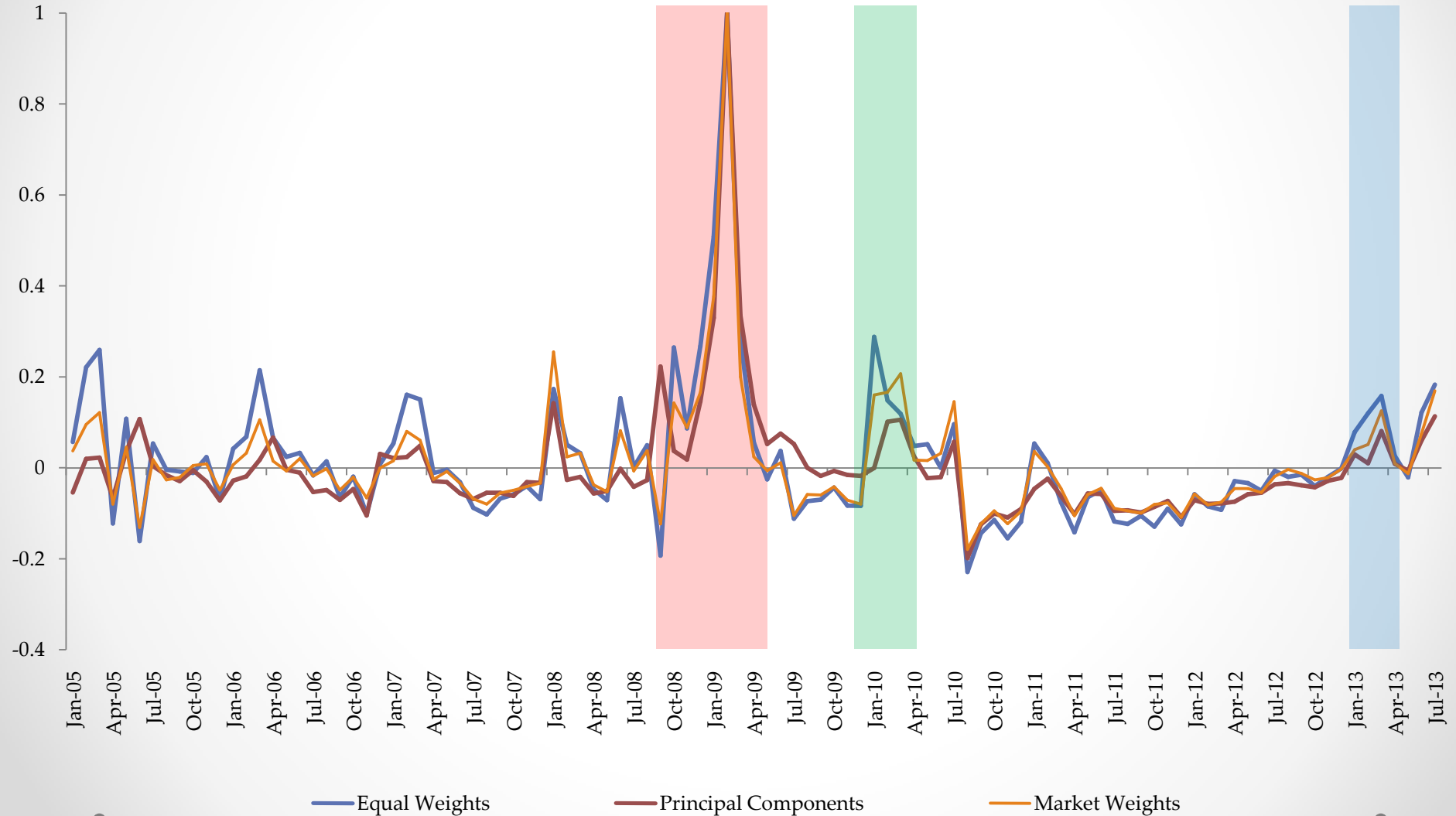
Classification of Stress Episodes	
Stress Episode	JFSI Classification
Grade 1 (Below Normal Stress)	$-1 \leq JFSI < -0.5$
Grade 2 (Low Stress)	$-0.5 \leq JFSI < 0$
Grade 3 (Moderate Stress)	$0 < JFSI < 0.4$
Grade 4 (High Stress)	$0.4 \leq JFSI < 0.7$
Grade 5 (Significant Stress)	$0.7 \leq JFSI \leq 1$

- A period of financial stress occurs when stress episodes prolong for at least 4 successive months.

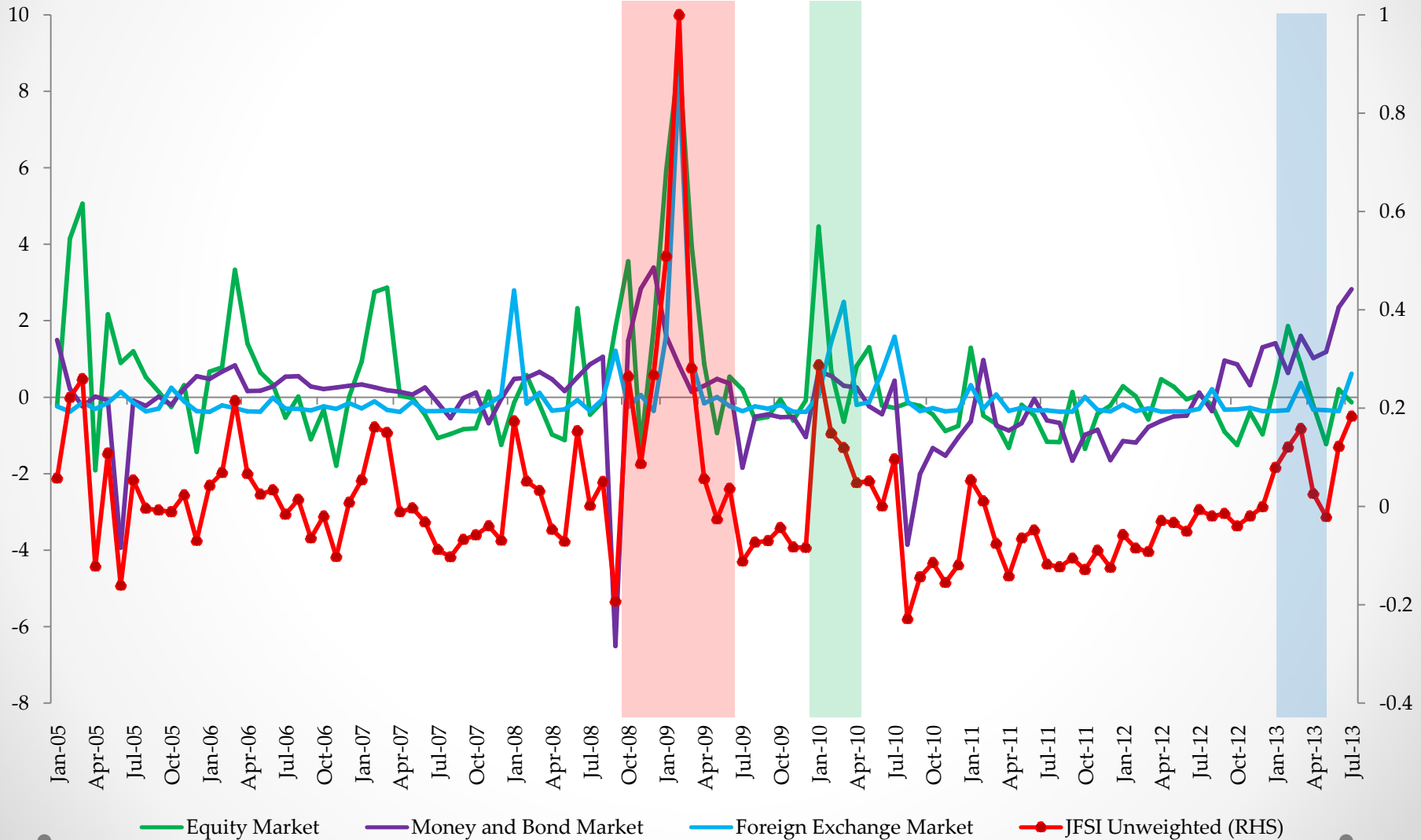
Results (I)

- The JFSI has the highest correlations with the volatility in the stock market and the volatility in the real effective exchange rate. 
- The indexes captured three key stress periods for Jamaica. 
 - Global Financial Crisis (2008-2009)
 - Jamaica Debt Exchange Programme (JDX) (2010)
 - National Debt Exchange Programme (NDX) (2013)
- The index peaked in February 2009 in the aftermath of the global financial crisis. This also represents the maximum historical value of the index. 

The JFSI



The JFSI and the Sub-indexes



Impact of the JFSI on Economic Activity

Regression Model

$$\begin{aligned}RGDP_t = & \alpha + \gamma_0 FB_{t-8} + \gamma_1 INTS_{t-5} + \gamma_2 HH(DEBT)_{t-3} + \gamma_3 NX_{t-12} \\ & + \gamma_4 \Delta UNEM_{t-1} + \gamma_5 \Delta XRATE_{t-4} + \gamma_6 JFSI_{(UNWEIGHTED)t-3} + \gamma_7 \Delta RGDP_{t-1} \\ & + \gamma_8 \Delta RGDP_{t-2} + \gamma_9 \Delta RGDP_{t-3} + \varepsilon_t\end{aligned}$$

RGDP- Real Gross Domestic Product (Growth rate)

FB- Fiscal Balance (Growth rate)

INTS- Interest Rate Spread Between Loans and Deposits

HH(DEBT)- Household Debt

NX- Net Exports (Growth Rate)

UNEM- Unemployment Rate

XRATE- J\$/US\$ Exchange Rates

JFSI_{UNWEIGHTED}- Simple Aggregated Index

α - Intercept

γ_i - Coefficients

ε_t - Error term

A priori Expectations

Variable	Expected Sign
$JFSI_{(UNWEIGHTED)t-3}$	(-)
FB_{t-8}	(?)
$INTS_{t-5}$	(-)
$HH(DEBT)_{t-3}$	(+)
NX_{t-12}	(+)
$\Delta UNEM_{t-1}$	(-)
$\Delta XRATE_{t-4}$	(+)
$RGDP_{t-1}$	(?)
$RGDP_{t-2}$	(?)
$RGDP_{t-3}$	(?)

Results (II)

- The JFSI index dummy, net exports, the interest rate spread and the unemployment rate have a lagged and negative effect on real GDP growth.
- Household debt, growth in the fiscal balance and the exchange rate contribute to increases in real GDP growth.
- A period of financial stress will cause a decline in real GDP growth of 0.07% three months into the future.

Table 3: OLS Results: Dependent Variable: $RGDP_t$

Variable	Expected Sign	Coefficients
$JFSI_{(UNWEIGHTED)t-3}$	(-)	-0.0007* (0.0004)
FB_{t-8}	(?)	4.01E-05*** (8.49E-06)
$INTS_{t-5}$	(-)	-0.0174 (0.0163)
$HH(DEBT)_{t-3}$	(+)	0.0023 (0.0036)
NX_{t-12}	(+)	-0.0029*** (0.0006)
$\Delta UNEM_{t-1}$	(-)	-0.0023*** (0.0007)
$\Delta XRATE_{t-4}$	(+)	0.0002 (0.0001)
$RGDP_{t-1}$	(?)	1.8480*** (0.1002)
$RGDP_{t-2}$	(?)	-1.3583*** (0.1652)
$RGDP_{t-3}$	(?)	0.4009*** (0.0966)
<i>Constant</i>		0.0019 (0.0023)
Adjusted R^2		0.9458
DW Stat		2.1314
F-Stat (p-Value)		151.0943 (0.0000)

White's Heteroskedasticity Robust Standard errors are in parentheses.

(*) implies significances at the 10% level, (**) at the 5% level and (***) at the 1% level

Conclusion

- The JFSI identified the global financial crisis, the JDX and the NDX as periods of financial stress in the economy.
- The JFSI was found to have a statistically significant impact on real GDP growth.
- It was found that an episode of financial stress will lower real GDP growth in the economy the third month after the episode by 0.07%.
- The JFSI is easily operationalized due to the accessibility of the data required and will add to suite of macro-prudential tools used by the BOJ.

Policy Implications

- Based on the findings for all the indexes, policies which limit volatility in the stock and foreign exchange markets will help to contain episodes of financial stress.
- Additionally, efforts to contain financial stress will help to increase the country's output in the long run.
 - Intervention in the foreign exchange market.
 - Build up investor confidence in the economy.

THANK
YOU!

