Measuring and Forecasting Financial Stability: The Composition of an Aggregate Financial Stability Index for Jamaica

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August 2010

Abstract

This paper develops an aggregate financial stability index (AFSI) for Jamaica using banking system data over the period March 1997 to March 2010. The AFSI builds on previous work for Jamaica by aggregating microeconomic, macroeconomic and international factors indicative of banking sector performance into a single measure of financial stability. The index was successful in capturing key periods of financial instability during the sample period and reflected a general improvement in stability. Econometric results affirm the sensitivity of the index to variability in key macroeconomic indicators. Against this background, Monte Carlo simulations were used to provide a one-year ahead forecast of financial stability in an effort to assist policymakers in determining the future state of vulnerability of the banking sector. Furthermore, forecasted values shows marked deterioration in the index during the second half of 2010.

JEL Code: C43, C51, C53, G01, G17
Keywords: financial stability, financial stability index, stochastic simulation.

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1. Introduction

Over the past decades, financial crises have increased in frequency and intensity and have threatened the robustness and stability of the international financial system. Financial system stability is of particular concern to policymakers as a weak financial system negatively impacts the real economy. In addition, instabilities in the financial markets can feed through to macroeconomic instabilities and lead to further deterioration in financial system soundness.

Against this background, policymakers continue to grapple with the task of developing comprehensive indicators and indexes which can be used as surveillance and forecasting tools in minimizing the likelihood of banking and financial crises. Langrin (2002) developed an Early Warning System Index for Jamaica, which involved the bi-variate monitoring of a comprehensive set of aggregate macroeconomic and microeconomic indicators in order to determine the future state of vulnerability of the banking sector. The index is currently one of the main surveillance tools used by the Bank in monitoring and assessing the stability of the overall banking system. Additionally, work by Lewis (2006) established an Early-Warning Bank Failure Model (EWM) for Jamaica's banking sector. This model is designed to capture the dynamics that engenders banks' transition from financial soundness to closure by using a transition probability matrix. By extension, the model assesses the likelihood of banks experiencing distress, the framework is utilized in assaying the effects of macroeconomic and bank-specific shocks on the stability of the commercial banking sector in the medium-term.

This paper proposes the construction of an aggregate financial stability index (AFSI) for Jamaica. Besides an early warning system and a stress testing tool, the index represents a single quantitative measure which can be used to capture and forecast the stability of the banking system. The model utilized is based on the methodology employed by Albulescu (2009), which derives a single financial stability index based on the aggregation of

constituent indicators or sub-indexes covering microeconomic, macroeconomic and international measures of vulnerability.

The remainder of the paper is organized as follows: Section 2 presents an overview of the literature. Section 3 provides details on the methodology employed in constructing the aggregate financial stability index and its constituent sub-indexes. Section 4 covers descriptive analysis of the factors influencing the evolution of the index and its constituent parts. The econometric validation of the AFSI and results of the Monte Carlo simulations are discussed in sections 5 and 6, respectively. The policy implications of the results and the conclusion are presented in section 7.

2. Literature Review

Some researchers have used synthetic indexes to capture multidimensional economic phenomena, like financial stability, which are difficult to quantify. A synthetic index is derived from aggregating different basic indicators. More specifically, financial system stability indexes are comprised of indicators that reflect the varied dimensions of financial stability. For instance, Illing and Liu (2003) developed a stress index, called the Financial Stress Index (FSI), for the Canadian financial system. Unlike the bi-variate nature of indicators used in the literature, the index provided a single measure of macroeconomic financial stress which is allowed to vary over a continuum of values, where extreme values reflect crises. The authors obtain information on financial stress from varied financial variables using techniques such as factor analysis, econometric benchmarking and Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) modeling, inter alia. [2]

This concept of a synthetic financial stability index has also been endorsed by Fell and Schinasi (2005) who stated, "… financial stability can be seen as being consistent with

[2] Illing and Liu (2003) approach is quite different from earlier work in that they set up a survey in order to select appropriate indicators in the building of the FSI. The survey was conducted on Canadian policy-makers and economists, whose responses dictated which events have been the most stressful for Canadian markets. These indicators spanned the banking sector, foreign exchange market, debt markets and equity markets.

various combinations of the conditions of its constituent parts …" With this in mind, Van den End (2006) created a Financial Stability Conditional Index (FSCI) which is an extension of aggregate indexes such as the Monetary Conditions Index (MCI) and the Financial Conditions Index (FCI).[3] Furthermore, regarding the FSCI, the index's lower bound indicates a stress situation. The upper bound of the index, while defining a favourable situation regarding market price movements, could also signal an accumulation of financial imbalances. Hence, low values or high values of the FSCI reflect malfunctioning in the financial system. Hence, the continuum of values lying between these bounds signal stability conditions in the financial system.

Albulescu (2009) developed an Aggregate Financial Stability Index (AFSI) for Romania over the period 1996 to 2008. The author selected 20 indicators that measured one of the following dimensions of the financial system: development of the banking sector; soundness; vulnerability and the world economic climate.[4] Sub-indexes were also developed based on these dimensions and formed the constituents of the AFSI. In developing the aggregate financial stability index all indicators were normalized so that there values ranged from 0 to 1. A value of 0 was assigned to the worst value over the analyzed period while a value of 1 was assigned to the best value over the same period. This eliminates disparity in units of measurement and enables aggregation. The author also applied equal weightings to each indicator in constructing the index. Additionally, Albulescu (2009) examined the robustness of the index to different drivers of macroeconomic stability and utilized a stochastic simulation model to provide a forecast of the AFSI for the Romanian banking system.[5]

[3] These indexes were developed to gain insight into monetary policy transmissions. The MCI was developed to gain insight into monetary policy transmission by aggregating long-term interest rates and the effective exchange rate and are considered transmission channels. The FCI is an improvement on the MCI as it incorporates house prices and stock prices in the aggregate.

[4] Due to globalization and free trade external financial systems may impact the financial system under study. The variables Albulescu (2009) considered are "world growth rate", "world inflation rate" and an index (calculated by CESifo) that measures world economic climate.

[5] The variables with significant coefficients were "foreign currency credit to GDP ratio", the "GDP growth rate" and the "Bucharest stock exchange index".

Based on the AFSI for the Romanian banking system, crisis periods were observed by the clear deterioration of the index during those periods. In particular, there was improvement of Romania's financial stability level commencing in 2000, which continued up to the recent sub-prime crisis period. Furthermore, forecasts show an expected improvement of the index in 2010.

.Gersl and Hermanek (2006) demonstrated that the constituent indicators in an AFSI can be used to make international comparisons by ranking the Czech Republic, along with the other Central European countries as well as some Eastern European countries based on their financial soundness.

3. The Aggregate Financial Stability Index

Researchers have utilized various methods to establish weightings for the variables included in the index. Moreover, recent work has shown that some researchers have relied more heavily on econometric analysis to establish weightings on the variables included in the index. Van den End (2006) demonstrated in the composition of his aggregate stability index the discrepancy between equal weighting and weighting by econometric validation was small. This paper uses the method of equal weighting across indicators.

Furthermore, in order to aggregate the variables into a single index each indicator is normalized to allow for comparability across variables. Several methods of normalization are discussed in the literature along with their shortcomings. [6] This paper employs the method of empirical normalization. Under this method, the indicators' values will range between 0 and 1, where a value of 0 represents the weakest value of an indicator. More specifically, the formula used for the normalization process is:

$$ {}_{n}I_{it} = \frac{I_{it} - \min(I_i)}{\max(I_i) - \min(I_i)} \qquad (1) $$

[6] Normalization includes the use of statistical, empirical axiological and mathematical methodologies.

where ${}_nI_{it}$ represents the normalized indicator at time t and I_{it} represents the value of the indicator at time t. In addition, max(I_i) and min (I_i) represent the respective worst and best values of each indicator.

Table 1: AFSI Indicators

Indicators	Impact	Subgroup
Market Capitalization/GDP	+	Financial Development Index
Total Credit/GDP	+	
Interest Spread	-	
Herfindahl – Hirschmann Index (HHI)	+	
Inflation Rate	-	Financial Vulnerability Index
General Budget Deficit/Surplus (%GDP)	+	
Current Account Deficit/Surplus (%GDP)	+	
REER (change)	-	
Non Governmental Credit/Total Credit	+	
Loans (%deposits)	-	
Deposits/M2 ("moving ratio")	+	
(Reserves/Deposits) / (Note & Coins/M2)	+	
Non Performing Loans/Total Loans	-	Financial Soundness Index
Capital/Assets	+	
Z-Score	+	
Liquidity Ratio	+	
World Economic Growth	+	World Economic Climate Index
World Inflation Rate	-	
Economic Climate Index	+	

Note: The effect of an increase in each indicator on the AFSI is indicated by the corresponding signs shown in the column headed "Impact".

For Jamaica, 19 indicators are chosen for inclusion in the AFSI. These indicators are reflective of different dimensions of financial stability, including financial development, financial vulnerability, financial soundness as well as the world's economic climate. Sub-indexes are also created to capture the impact of each of these areas on financial stability (Albulescu, 2009). For banking sector variables, data was collected on the commercial banks, merchant banks and building societies, and classified in terms of sub-indexes (See Table 1).[7]

[7] Credit union data were excluded due to unavailability over the entire sample period.

The 'financial development sub-index' gives a measure of the level of financial system development (see **Table 1)**. Market capitalization as a share of GDP captures the development of the capital markets, while the ratio of total credit to GDP provides information on the ability of credit institutions in carrying out their intermediation functions. Increases in the values of these indicators are expected to lead to improvements in this sub-index. In addition, the interest spread variable included in the sub-index is defined as the difference between lending rates and borrowing rates. Higher 'interest spreads' are interpreted as greater inefficiency in intermediation and allocation of resources while lower spreads are indicative of improved efficiency levels in the banking system. Thus, higher interest spreads are inversely related to financial development and will have a negative impact on the AFSI. The Herfindahl – Hirschmann Index (HHI) was also included in this sub-index and is representative of the degree of concentration in the banking sector.[8] Subsequent to the financial crisis of the 1990's, several mergers took place, resulting in a sharp increase in the HHI. However, evidence has shown that this development has been associated with improvements in efficiency in the sector.[9] Against this background, increases in the HHI are interpreted as having a positive impact on stability in Jamaica's case.

Regarding the 'financial vulnerability sub-index', indicators included in this category cover macroeconomic variables as well as the funding structure banking institutions. The vulnerability index gives a measure of how well the financial system can respond to shocks. The inflation rate and fiscal budget deficit as a share of GDP are included as a signal of investor confidence in the economy given the implications this can have for the financial markets and financial stability. In addition, the current account deficit as a share of GDP signals the country's susceptibility to external shocks. Absolute changes in the REER were also included in this sub-index. These changes reflect adjustments in the exchange rates as a corrective measure in the economy and have implications for economic stability. The ratio of non-governmental loans to total credit reflects bank funding of private sector credit and the scope for growth in productive investments.

[8] The HHI is the sum of the squares of all bank's percentage share of deposits.
[9] See Bailey (2007)

Loans as a percentage of deposits is indicative of whether institutions face difficulties in efficiently performing their intermediation functions. Deterioration in deposits as a share of M2 signals decreased savings and increased consumption and this can fuel inflationary tendencies in the economy which has implications for financial stability. The final indicator of the 'financial vulnerability sub-index' retained the ratio of 'reserves to deposits' and 'notes & coins to M2', act as an early warning indicator. Reserves as a share of deposits reflect the banking sector capacity to respond to severe deposit withdrawal, while notes & coins to M2 measures the liquidity preference of the economy. Thus, a high liquidity preference coupled with low reserves would signal increased vulnerability in the banking system.

The variables retained in the 'financial soundness sub-index' measures the solvency of credit institutions in the financial system. 'Non performing loans to total loans' reflects the loan quality of banks and their level of capitalization is measured by the "capital to assets" ratio. The 'Z-score' is a measure of the probability to the risk of insolvency.[10] The liquidity ratio is a measure of banks' resilience to cash flow shocks (Gersl and Hermanek, 2006).

Regarding the 'world economic climate sub-index', indicators that fundamentally impact both local and foreign investors' confidence level in the financial system are included. Notably, 'world economic growth' and 'world inflation rate' were calculated by calculating the weighted averages of data from the top six countries which participate in trade with Jamaica. The economic climate index was sourced from the Centre for Economic Studies & Institute for Economic Research (CESifo). [11]

After normalization, indicators were combined into their respective sub-indexes (see equations 2 – 5):

$$\text{financial development index, } \overline{D}_t = \frac{\sum_{i=1}^{4} D_{it}}{4} \qquad (2)$$

[10] Calculated quarterly by the BOJ as: $Z = \frac{ROA + C/A}{STD\ DEV\ (ROA)}$

[11] http://www.cesifo-group.de/portal/page/portal/ifoHome/a-winfo/d6zeitreihen/15reihen/_reihenwes

financial vulnerability index, $\overline{V}_t = \frac{\sum_{i=1}^{8} V_{it}}{8}$ (3)

financial soundness index, $\overline{S}_t = \frac{\sum_{i=1}^{4} S_{it}}{4}$ (4)

world economic climate index, $\overline{W}_t = \frac{\sum_{i=1}^{3} W_{it}}{3}$ (5)

Finally, the aggregate financial stability index is composed as follows:

$$AFSI_t = \frac{4\overline{D}_t + 8\overline{V}_t + 4\overline{S}_t + 3\overline{W}_t}{19} \quad (6)$$

In constructing the AFSI equal weights are applied across the indicators while the sub-indexes are unevenly weighted. The vulnerability index is the most heavily weighted while the world indicator was given the least weighting, with the development and soundness sub-indexes receiving equal weights. The vulnerability index received majority weights because it captures a wider range of risks, in particular macro-economic risks and bank-specific factors. Also, among the other sub-indexes it tracked the crisis periods the closest.

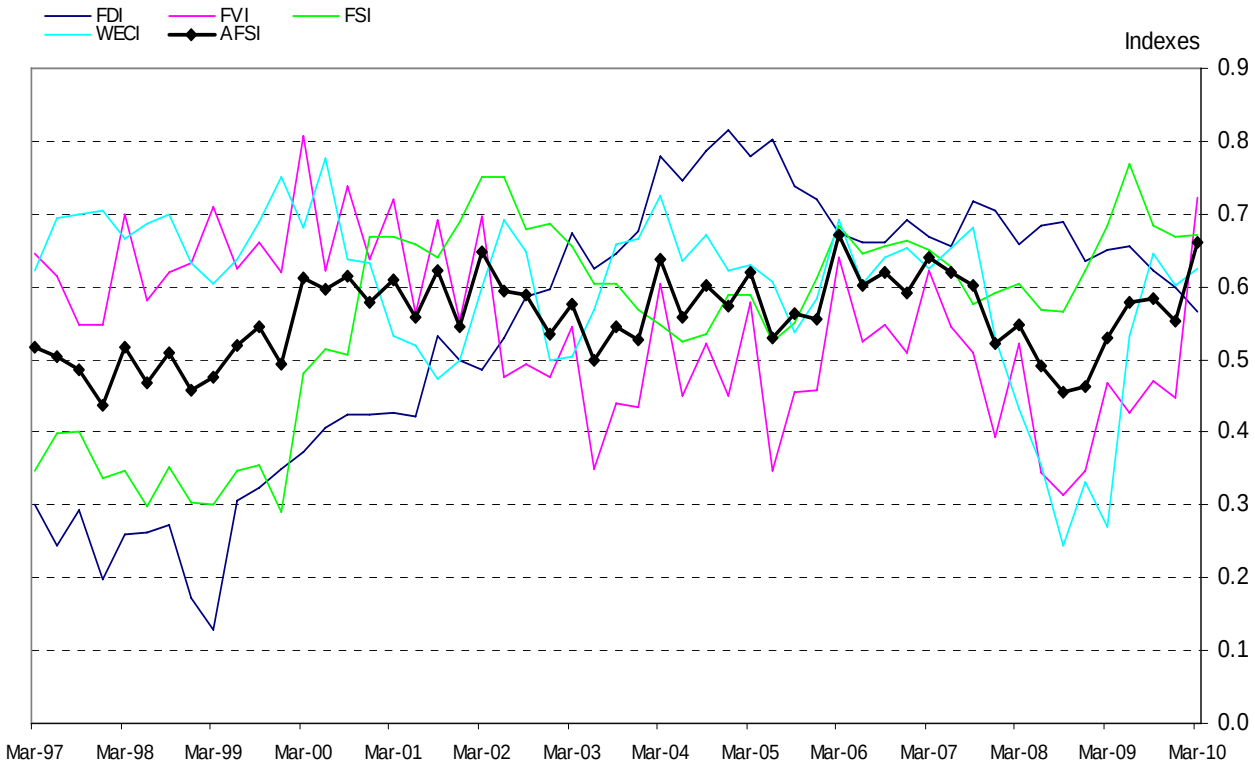
4. The Evolution of the AFSI and its Constituent Indexes: March 1997 – March 2010

The AFSI is constructed in this paper using quarterly data for the period March 1997 to March 2010. The evolution of the AFSI and its sub-indexes closely tracks stability in the Jamaican banking sector over the sample period (see **Figure 1**). A general sharp deterioration was observed in the AFSI and its sub-indexes during the financial crisis period of the late 1990s, with the index averaging below 0.5. [12] During this period, strong

[12] At the end of 1997 the AFSI deteriorated to a low of 0.438.

reforms were implemented and adjustments were made in the banking system. [13] Subsequent to completion of the majority of reforms in 1999, there was consistent improvement in the ASFI, with values ranging between 0.54 and 0.65, consistent with a relatively stable financial sector. During 2003, primarily in the second quarter, a deterioration as low as 0.49 was observed which occur amidst instability in the foreign currency exchange rate causing the Bank of Jamaica to increase interest rates. There was also a sharp fall-off in the index during the global financial crisis period that culminated in 2008. At this juncture, the AFSI fell to a low of 0.46 in the third quarter of 2008.

Figure 1: Graph of the Aggregate Financial Stability Index and its Constituent Sub-Indexes



[13] The Financial Sector Adjustment Company (FINSAC) was formed in January 1997 with a mandate to rehabilitate financial institutions. Other measures to restore stability to the financial system involved regulatory and legislative reforms including amendments to the banking, financial institutions and building societies acts. In addition, the 1988 Basle Accord was adopted in Jamaica in 1999 as a "standard of best practice," to complement the existing leverage requirement, for banks to maintain prudent capital positions.

Among all the sub-indexes, the financial development index (FDI) reflected the strongest fluctuations, increasing sharply over the first half of the review period (March 1997 – March 2010) with values ranging from 0.13 to 0.81. Then, at the end of the financial crisis period in 2000, there was an observed improvement in the FDI, which continued up to 2004. Subsequent to 2004, the FDI remained relatively stable for the rest of the review period.

As anticipated, the financial soundness index (FSI), recorded its lowest levels during the financial crisis period of the 1990s. Recovery began in the final quarter of 1999 and an upswing was observed which peaked at the beginning of 2002. The sub-index remained relatively stable after 2002 and showed only slight deterioration during the 2008 global crisis period. However, the world economic climate index (WECI) recorded substantial fallout over this global crisis period which significantly influenced the value of the AFSI. In fact. the WECI, coupled with deterioration in the financial vulnerability index (FVI), were the main contributors to the decline in the AFSI in 2008.

5. AFSI Econometric Validation

The evolution of the AFSI was successful in identifying the impact of periods of financial uncertainty on the performance of the Jamaican banking system. Nonetheless, an empirical assessment was also conducted, using ordinary least squares, to examine the performance of the index in response to changes in some key macroeconomic variables.[14] Against this background, the AFSI was regressed against volatility in the REER, volatility in the JSE index, growth in remittances, growth in the money supply (M2), exchange rate changes (JS/US$ rate), changes in the 6-month GOJ Treasury bill yield, GDP growth rate, a dummy variable capturing periods of financial distress as well as lagged values of the index.

[14]These variables were chosen because they are strongly impacted during periods of crisis. Due to data limitations, variables such as interbank interest rates and foreign currency to GDP had to be omitted from the regression analysis. Albulescu (2009) included interbank interest rate as a measure of vulnerability and foreign currency to GDP due to its role of amplifying a crisis situation if its growth rate is higher than the growth rate of the economy.

All variables used in the regression were subjected to stationary tests. The results of the Augmented Dickey-Fuller (ADF), the Phillips-Perron (PP) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests indicate that all variables had unit roots except the AFSI, volatility in REER and growth in M2 (see Table 2). The series' with unit roots were stationary in first differences.

The coefficients for the AFSI lagged one and two quarters, changes in the Treasury bill yield, growth in M2, as well as its lagged value, were statistically significant (see Table 3). The equation employed for the econometric evaluation is given as:

$$afsi = c + \alpha * afsi_{t-1} + \beta * afsi_{t-2} + \delta * \Delta tbill + \gamma * m2 + \eta * m2_{t-1} + \varepsilon_t \qquad (7)$$

where *afsi* is the aggregate stability index, *tbill* is the yield on 6-month Treasury bill and *m2* is the growth in money supply (M2)

Table 2: Unit Root Tests and Stationarity Tests

Variables	ADF		PP		KPSS	
	Level	Difference	Level	Difference	Level	Difference
Null Hypothesis	Unit Root		Unit Root		Stationarity	
AFSI	-3.8845***	-	-4.8406***	-	0.0683	-
Exchange Rate	0.9031	-5.0838***	0.8522	-4.1176***	0.9675***	0.2845
T-Bill Yield	-2.5588	-7.3450***	-2.5588	-7.3477***	0.4161*	0.0617
JSE Index (volatility)	-2.0493	-6.2391***	-2.0759	-6.7456***	0.5391**	0.1092
REER (volatility)	-4.9961***	-	-6.6592***	-	0.2764	-
Remittance Inflow	-0.6854	-3.5725**	-0.8519	-14.9694***	0.9506***	0.1353
M2 (growth rate)	-4.2783***	-	-22.8253***	-	0.4973**	0.2062
GDP	4.7793***	-0.7462	13.1836***	-5.1309	0.9605***	1.0384***

Notes: *, **, *** indicates the rejection of the null hypothesis at 10, 5 and 1 per cent level of significance respectively (t-statistics).

The regression results show that the values of the AFSI in previous quarters will impact the present value of the index (see **Table 3**).[15] However, the index is mean reverting so it will not exhibit explosive properties (see **Figure 1**). [16] In addition, there is a negative relationship between the 6-month Treasury bill yield and the AFSI, indicating that increases in interest rates can stimulate deterioration in aggregate stability such as by influencing an increase in the default rate on loans (see Bordo, Dueker and Wheelock, 2000). The signs on the M2 variables are somewhat contradictory; the one period lag has a positive effect on the index while the contemporaneous effect is negative. An explanation of this outcome is provided in work done by Lucas (1972, 1973) and Bordo *et al.* (2000). They posit that current period growth in the money supply is partly unobservable. However, unexpected growth in money supply can lead to inflation 'surprises' which can stimulate deterioration in stability. Furthermore, when growth in the money supply of a previous quarter is realized investors are better able to make sound financial judgment which can foster improvements in stability conditions.

Table 3: Econometric Results

Variables	Coefficients	Standard Error
C	0.146383**	0.061479
AFSI(-1)	0.452740***	0.12928
AFSI(-2)	0.293252**	0.12869
D(TBILLS)	-0.004621***	0.001495
M2	-0.385146**	0.152752
M2(-1)	0.272220*	0.158338
Dependent Variable	AFSI	
Method	Least Squares	
No. of Observations	51	
Adjusted R-Squared	0.553893	
Durbin-Watson Statistics	2.060697	

Notes: *, **, *** indicates the rejection of the null hypothesis at 10, 5 and 1 per cent level of significance respectively (t-statistics

[15] A stable (deteriorated) index in the past will result in future stability (instability).
[16] Further the coefficients are less than unity.

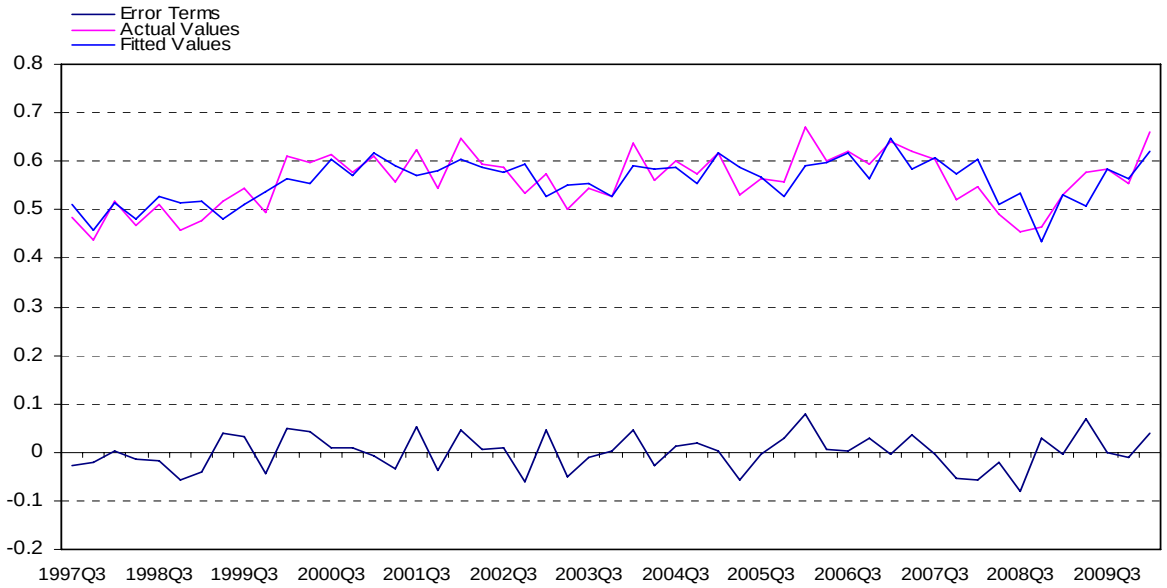
Applying the ADF, PP and KPSS to the residuals from the estimated equation we see that this series has no unit root. The results from diagnostic tests show that the error term is serially uncorrelated and both the Breusch-Pagan-Godfrey test and White test confirm that the error terms are also homoskedastic (see **Table 4**). The adjusted R-Squared is 0.55, which suggests that the model is a good fit of the actual data (see **Figure 2**).

Table 4: Serial Correlation Test and Heteroskedasticity Tests

Breusch-Godfrey Serial Correlation LM Test		
	Statistic Value	P-Value
F-Statistic	0.40	0.68
Obs*R-squared	0.92	0.63
Heteroskedasticity Test: Breusch-Pagan-Godfrey		
	Statistic Value	P-Value
F-Statistic	0.53	0.75
Obs*R-squared	2.86	0.72
Heteroskedasticity Test: White		
	Statistic Value	P-Value
F-Statistic	1.01	0.48
Obs*R-squared	20.52	0.94
No. of Observations: 51		

Notes: *, **, *** indicates the rejection of the null hypothesis at 10, 5 and 1 per cent level of significance respectively (t-statistics).

Figure 2: Actual AFSI and Estimated AFSI

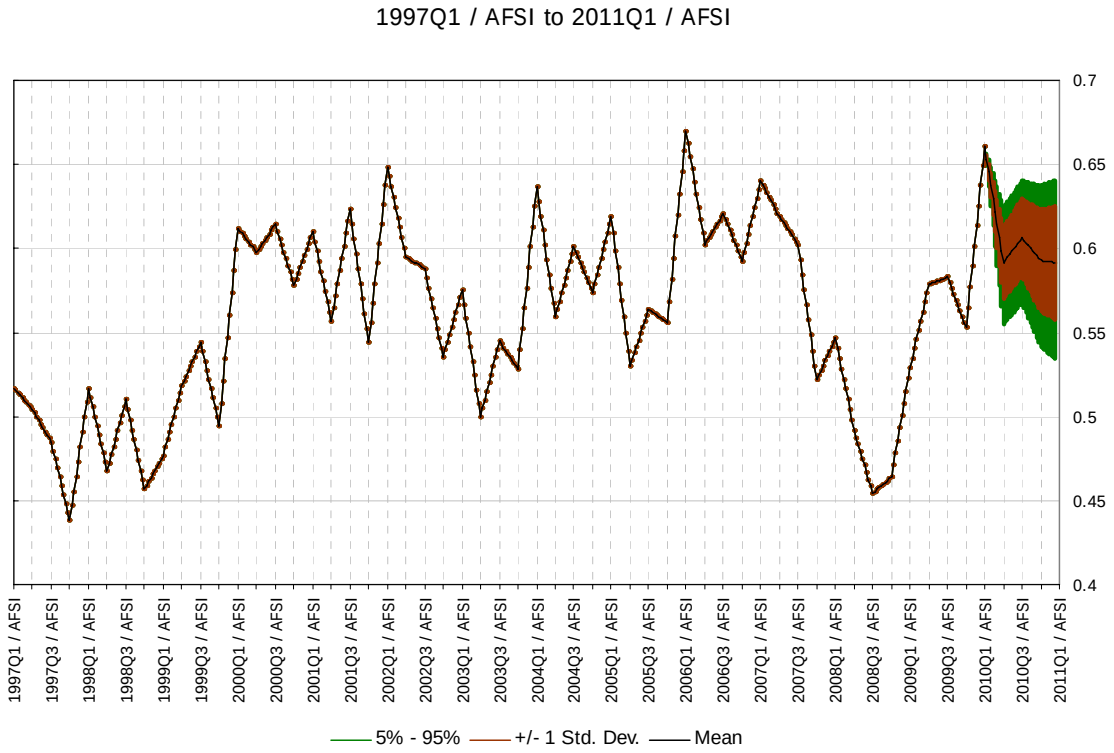


6. A Monte Carlo Simulation and AFSI Forecast

The historical values of the AFSI and the exogenous variables reflected in **Table 3** were utilized in producing a forecast of the index. Both the Treasury bill yield series and the M2 growth rate series were fitted with a distribution function based on their historical values. Using the fitted distributions as well as correlation between the exogenous variables in the estimation and Monte Carlo simulation (10 000 iterations), a four-quarter ahead forecast of the AFSI was generated along with a fan chart for the forecasted values of the AFSI (see **Figure 3)**.

The AFSI increased steadily up to the first quarter of 2010, following the sharp deterioration in the index during the global crisis period. However, regarding forecast results, the deterioration evident in the index during the second half of the year is largely reflective of the impact of anticipated seasonal increases in M2 during this period.

Figure 3: A Forecast of the AFSI for Jamaica's Economy



7. Conclusion

The aggregate financial stability index developed in this study can be used to complement and enhance the existing financial stability framework that is monitored by the Bank of Jamaica. The index represents a single comprehensive measure of stability and includes indicators capturing banking sector development, vulnerability, soundness and the international economic environment. The evolution of the index shows a close reflection of banking sector performance over the sample period. Econometric results also confirm the sensitivity of the index to variability in key macroeconomic indicators.

The index can also be used as an early warning tool for policymakers as various dynamic simulation techniques can be used to predict stability in the banking sector, where a low level in the AFSI is indicative of deterioration in the stability of the financial system. Forecast results from the study predict deterioration in the index in the short-term. This is influenced by seasonal increases in M2 during the second half of 2010 and reflects the potential consequences of inflationary impulses on financial stability.

References

Albulescu, Claudiu Tiberiu. 2010. "Forecasting Romanian Financial System Stability Using a Stochastic Simulation Model." *Romanian Journal of Economic Forecasting*, 13(1): 81-98

Albulescu, Claudiu Tiberiu. 2008. "Assessing Romanian Financial Sector Stability by Means of an Aggregate Index." *Oeconomica*, 17(2): 67-87

Bailey, Sherene A. 2007. "Investigating the Market-Structure – Performance Relationship in the Commercial Banking Sector." *Money Affairs*, 22(1).

Bergman, Michael U., and Jan Hansen. 2002. “Financial Instability and Monetary Policy: The Swedish Evidence.” Sveriges Riksbank Working Paper Series 137.

Bordo Michael D, Michael J. Dueker and David C. Wheelock. 2000. “Aggregate Price Shocks and Financial Instability: An Historical Analysis.” National Bureau of Economics Research Working Paper Series 7652

Fell, J. and G. Schinasi. 2005. “Assessing Financial Stability: Exploring the Boundaries of Analysis.” *National Institute Economic Review*,192:102-117.

Gersl, Adam, and Jaroslav Hermanek. 2006. “Financial Stability Indicators: Advantages and Disadvantages of their Use in the Assessment of Financial System Stability.” Financial Stability Report, Czech National Bank.

Hadad, Muliaman D., Sugiharso Safuan, Wimboh Santoso, Dwityapoetra S. Besar, and Ita Rulina. 2007. “Macroeconomic Model to Measure the Financial Stability Index: Indonesian Case Study.” Money, Macro and Finance Research Conference, Birmingham Business School.

Illing, Mark, and Ying Liu. 2003. “An Index of Financial Stress for Canada.” National Bank of Canada Working Paper 14.

Langrin, Brian. 2002. “An Early Warning System for the Prevention of Banking Sector Crises in Jamaica.” (Bank of Jamaica Working Paper).

Lewis, Jide. 2006. “An Early Warning Model of Bank Failure in Jamaica: An Information Theoretic Approach”. (Bank of Jamaica Working Paper).

Lucas Jr., Robert E. 1973. “Some International Evidence on Output-Inflation Tradeoffs.” *American Economic Review*: 326-324.

Lucas Jr., Robert E. 1972. “Expectations and the Neutrality of Money.” *Journal of Economic Theory*: 103-124.

Mishkin, Frederic S. 2000. “Financial Stability and the Macroeconomy.” Central Bank of Iceland Working Paper 9.

Ramocan, Eliud George. 2010. “Assessing the Impact of the Global Economic Recession on Remittance Flows to Jamaica.” (Bank of Jamaica Working Paper)

Van den End, Jan Willem. 2006. “Indicator and Boundaries of Financial Stability.” De Nederlandsche Bank Working Paper 97.