SPECIAL REPORT

TD Economics

September 28, 2016

MEASURING U.S. FINANCIAL STRESS

Highlights

- The American and global economy are often characterized as full of risk. In the past year, there have been three stock market swoons as investors evaluate the implication of a global economy that cannot gain traction while new elements enter the equation, like Brexit.
- The increased frequency of volatility has made the assessment of global financial stability all the more challenging.
- The TD Economics U.S. Financial Stress Index helps make this evaluation easier. Our index aggregates 12 measures of financial stress to determine if markets are experiencing bouts of stress that are systemic in nature. Both international and domestic risks are captured in the index.
- In this paper, we also delve into three prevailing domestic risks that have the potential to evolve into headwinds for financial markets and trigger a deterioration in the Financial Stress Index. These are CRE valuations, sub-prime auto lending, and non-investment grade corporate debt.

Market observers are faced with a growing challenge. With the frequency of global risk events on the rise, a proper assessment of the state of global financial stability has become an increasingly difficult task. Not all financial market indicators move in tandem, or even in the same direction, obscuring appraisals of the level of risk present and the state of the outlook. Case in point, as equity, fixed income, and FX volatility subsided in the wake of Brexit, a number of key financial metrics continue to indicate stress. For example, measures of interbank lending conditions are now at levels not seen since the peak of the European sovereign debt crisis in 2011 and low quality corporate bond spreads remain above the post-financial crisis average, reflecting a repricing of risk premia across certain sectors. Clearly the dichotomy in financial indicators makes the measurement of today's level of financial market stress a difficult task.

Introducing the U.S. Financial Stress Index

To overcome the potential problem of focusing solely on one financial indicator at the expense of others, TD Economics has created the U.S. Financial Stress Index (FSI). The FSI is a daily aggregation of 12 different measures of risk across multiple markets and sectors, including short-term credit and liquidity risk, corporate, MBS, and ABS spreads, as well as measurements of volatility across equity and bond markets (see the box at the end of the paper for further discussion). The index is standardized such that readings of zero imply average levels of financial market stress, while readings above and below zero represent higher and lower levels of stress, respectively.

The FSI acts as a warning signal for risks emanating from financial markets. It is a leading indicator for important measures

CHART 1:TD U.S. FINANCIAL STRESS INDEX

Source: TD Economics.

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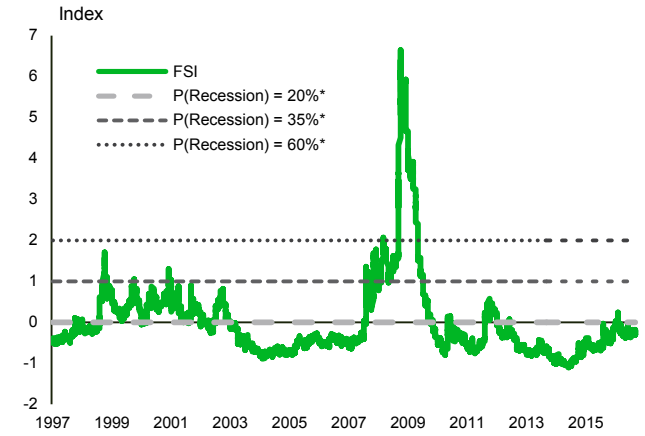
of economic growth, such as consumer confidence and industrial production. In addition, it can also be used to forecast the probability of a recession. A reading below zero (where we currently stand) infers a near zero probability of recession over the next 6 months. Should the FSI rise above zero, which occurred briefly in early-2016, it would imply a 20% probability of recession (Chart 2).

Bank funding costs driving the index

The increase above zero in early February was significant, marking the first time the index had breached the zero threshold since the European sovereign debt crisis. Overall stress in financial markets has since subsided, but the gradual trend higher in the FSI over the last two years gives an impression of a slow and steady build-up of stress across U.S. financial markets. While there is an element of truth to that, the overall trend higher in the FSI has more to do with the normalization across a breadth of spreads over the last year, largely reflecting the gradual withdrawal of monetary accommodation by the Federal Reserve. In looking at the heat map below, we provide a breakdown of each of the variables included in the FSI, and how much each has contributed to the move higher (or lower) in the index. Indicators which have contributed the most are shaded in dark red, while the indicators that have subtracted the most are shaded in dark green. The heat map clearly shows that the short-term credit and liquidity measures have consistently been the biggest contributor to the index over the past year. This is in part due to new regulation changes enacted by the Securities Exchange Commission, which is causing an outflow of investment from money markets that hold certificates of deposits and commercial paper. Ultimately, this has put upward pressure on bank fund funding costs (LIBOR) and the FSI, leaving the index just below normal levels.

CHART 2: FINANCIAL STRESS NOT YET SIGNALING RECESSION



Source: TD Economics

CRE concerns could further hit interbank lending

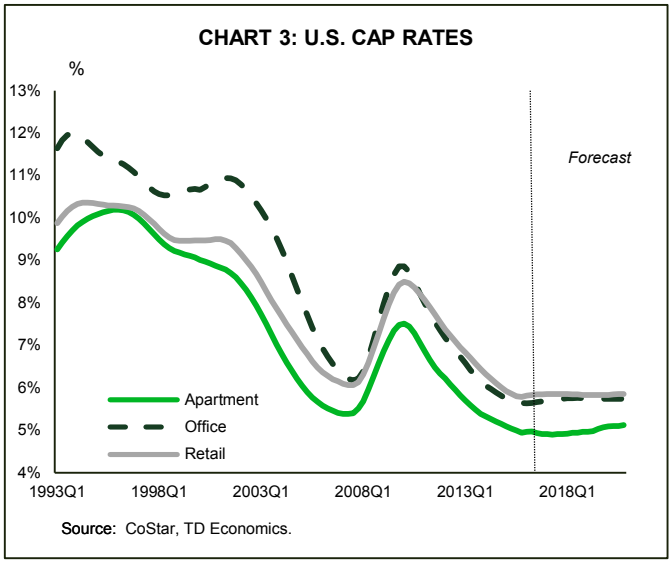
Going forward, interbank components of the FSI are likely to be a continued source of movement and volatility in the index. A key risk we are currently tracking is potential overvaluation in the CRE market and whether or not an unwinding could lead to expectations of higher non-performing loans and potential write-downs. In turn, we could see this translate into further increases in the FSI as a result of, again, higher interbank lending rates and bank credit spreads.

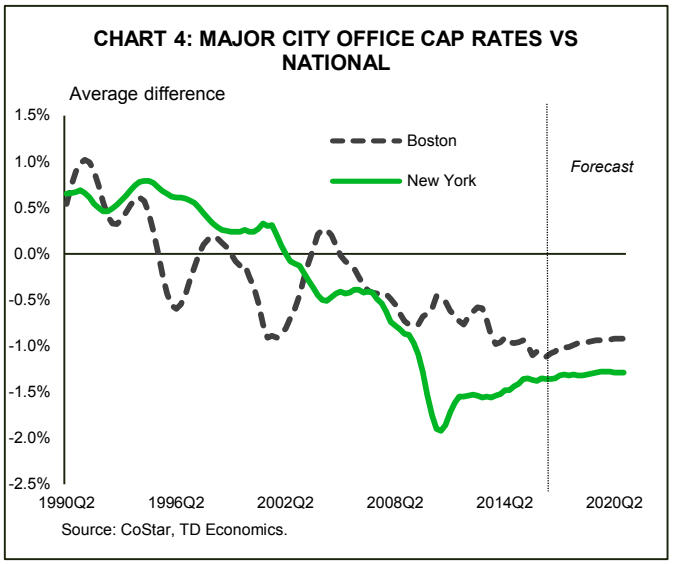
TD ECONOMICS FINANCIAL STRESS INDEX AS OF SEPTEMBER 2016

	Variable	Monthly Contribution	Contribution 3-Months Prior	Contribution 1 Year Prior
Yield Spreads	3-Month LIBOR/3-Month Treasury Bill Spread	0.019	0.024	-0.253
	3-Month LIBOR/OIS Spread	0.049	0.039	-0.091
	3-Month Commercial Paper (AA Financial)/3-Month Treasury Bill Spread	0.036	0.030	-0.007
	10-Year+ BofA & Merrill Lynch A Corporate/10-Year Treasury Spread	-0.015	-0.012	-0.140
	10-Year+ BofA & Merrill Lynch BBB Corporate/10-Year Treasury Spread	-0.009	-0.028	0.290
	10-Year+ BofA & Merrill Lynch Junk Corporate/10-Year Treasury Spread	-0.013	-0.042	0.344
	Auto ABS/5-Year Treasury Spread	0.018	-0.001	0.001
	Credit Card ABS/5-Year Treasury Spread	-0.025	0.001	-0.503
	30-Year MBS/10-Year Treasury Spread	-0.024	-0.003	-0.289
	10-Year Treasury Off/On the Run Spread	-0.095	0.005	-0.992
Other	VIX	-0.107	-0.061	-0.525
	MOVE (1-Month)	-0.098	-0.032	-0.866
Total Change in Financial Stress Index		-0.26	-0.08	-3.03

In the global search for yield, institutional investors have flocked into high yielding, high cash flow CRE investments. This has helped office buildings on a national level post strong double-digit price increases in four of the last five years, in turn pushing capitalization rates to historic lows (Chart 3). Unprecedented valuations have caused many to question the sustainability and systemic risk inherent in this market.

In fairness, when we compare national cap rates of apartment, office, and retail buildings, versus government and corporate bond yields, relative rates are comfortably at their 25-year historical averages. But, when we look at specific metro areas, such as New York, Washington, and Boston, those relative rates have steadily fallen well below their historical averages. This is ever-present in commercial offices, where cap rates in major metro areas are a full percentage point lower than the national average (Chart 4). Whether or not this becomes a problem will rest on the employment prospects for these metros. Just as we may soon see with the UK, an exodus of employment may cause higher vacancy rates and lower valuations. Brexit has made this reality more probable and subsequently sparked an exit out of various UK property funds. The negative price action in UK Real Estate Investment Trusts (REITs) was swift and spread to the share prices of UK bank stocks. Given that CRE as an asset class is highly prone to foreign investment, a change in confidence towards employment and return potential in high profile/high valuation gateway metros could result in a similar story playing out. Ominously, we have already seen lending to CRE investments fall in the wake of the UK event. Certainly, CRE valuations could readjust with a soft landing, but if there is a strong correction, this would directly impact U.S. bank loan books and overall bank stock prices.



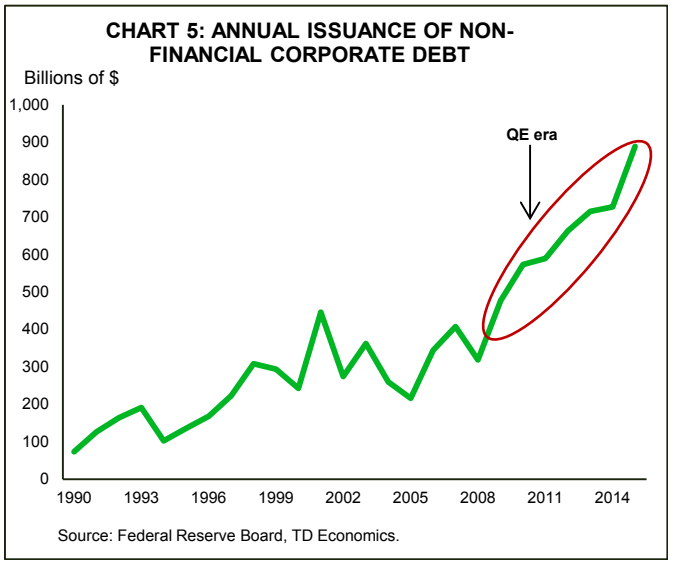


A higher perception of risk would likely translate into higher levels of LIBOR relative to OIS and 3-month Treasuries, as well as Financial CP spreads, thereby pushing the FSI higher.

High issuance and delinquency rates in non-investment grade leave some sectors vulnerable

Like commercial real estate, the FSI could also be impacted by increasing levels of corporate debt and delinquency rates. The FSI tracks corporate bond yields of various credit qualities, which have historically spiked prior to every U.S. recession. A reappraisal of credit risk would certainly cause a shift in the FSI.

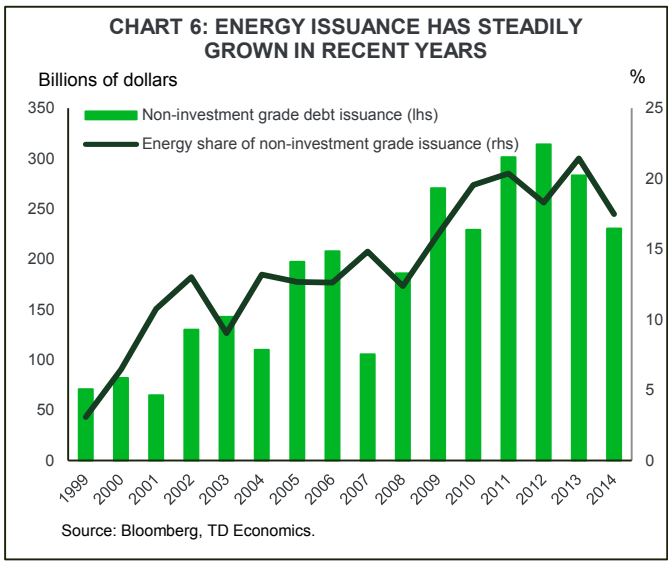
This risk is under scrutiny as issuance of U.S. non-financial corporate debt surged in recent years, topping

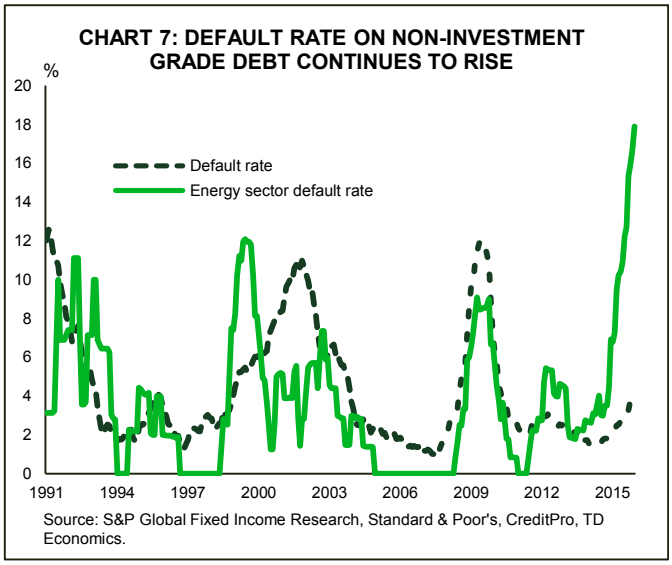


$888B in 2015 or roughly four times the pre-crisis average. Of the corporate debt issued since 2009, a growing share has been concentrated in the non-investment grade (NIG) space. Between 1996 and 2006, NIG issuance only accounted for roughly 14% of total corporate issuance, but that share rose to an average of 23% between 2010 and 2014 (Chart 6). A disproportionate amount of the NIG debt issued during this time was concentrated in the energy sector. As oil prices plummeted from late-2014 and into 2015, spreads on junk energy debt widened by as much as 1600 basis points.

Since then, energy spreads have narrowed considerably alongside the rebound in oil prices. Yet, the trailing 12-month default rate for U.S. NIG debt has continued to trend upwards, reaching a six-year high in June. Unsurprisingly, much of the increase in the default rate is related to the energy sector, which currently sits at 18% (Chart 7). Through the first six months of 2016, defaults on energy debt have already topped $50B. Default rates across other sectors including aerospace/automotive/capital goods and consumer/services are also trending higher, but remain low at only 1-2%.

Even with WTI at $40-50, it would appear that the landscape will remain a challenging one for companies with commodity exposure. We have seen U.S. oil production slow by roughly 1M barrels/day, yet global production remains near record highs. Profit margins will thus remain thin for producers over the next several years, leaving smaller companies with less cash reserves particularly vulnerable. This is especially true when you consider that an increasing amount of non-investment grade energy debt is expected to mature over the next several years (Chart 8).

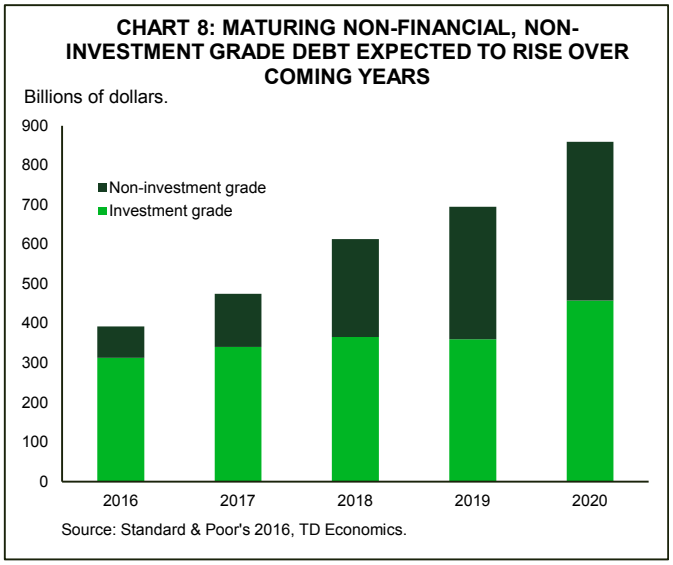




With NIG debt increasing noticeably across most sectors (even when we exclude energy), this puts a larger share of the total outstanding debt at-risk of default should the right shock originate. Given that the FSI includes spreads of both IG and NIG debt, TD Economics will be able to closely monitor any developments in risk migration across the corporate credit spectrum.

Oil producing states feel the pinch from increased subprime auto lending

The FSI also includes credit spreads on asset-backed (ABS) and mortgage-backed securities (MBS). As a result of the financial crisis, we are very much aware of how lost confidence in these securitized assets can cause financial stress. At the moment, it appears that the U.S. ABS market, particularly in the auto space, has seen a lot of risk taking. This is likely another beneficiary from the global search for



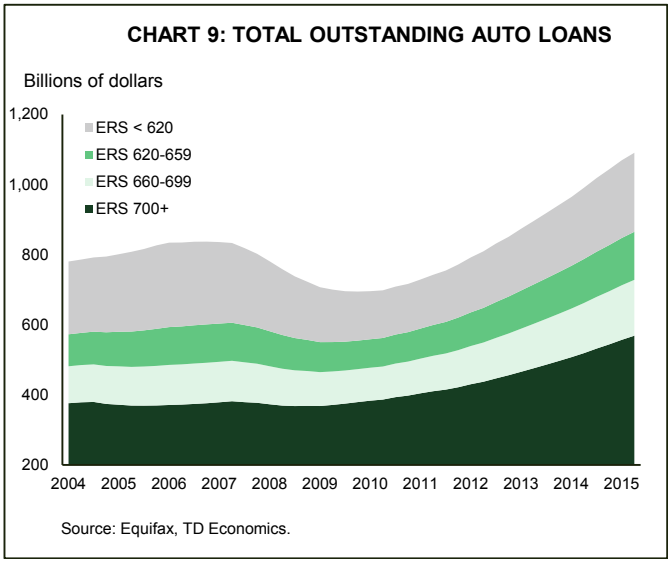
yield, as high investor demand for ABS allowed lending activity across auto finance dealers to flourish in recent years. Subprime lending was by far the biggest beneficiary and lending across the lower credit qualities surged as a result. Subprime lending among auto finance dealers now accounts for over 30% of origination activity (Chart 9).

In addition to the deterioration in loan quality, there has also been a substantial increase in loan terms. This creates a longer period of negative equity, where the borrower is underwater. For lower credit quality borrowers, who are more susceptible to a negative employment or income shock, the probability of the loan becoming delinquent at some point over its lifecycle increases dramatically.

In fact, we have already started to see this play out in some oil producing states. Specifically, 30-day subprime auto delinquency rates in Texas, Louisiana, and North Dakota have either reached or surpassed their respective highs experienced during the last recession. The lion's share of loans that are becoming 30-days delinquent are working their way through past delinquency and are ultimately getting charged off. As of July, charge-off rates across all three states were hovering near their respective 2009 peak levels (Chart 10).

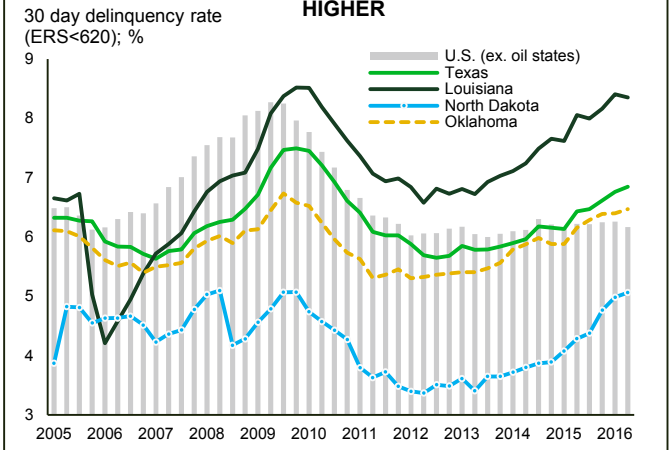
At the national level, things look far less dire. The 30-day delinquency rate has started to tick higher in recent years, but this is purely due to the oil-producing states. After removing Texas, Louisiana and North Dakota, the 30-day delinquency rate for subprime auto loans is flat and is currently sitting near all-time lows. Even still, the employment shock to the oil & gas sector highlights the potential vulnerabilities now present in the auto space following years of loose borrowing

CHART 9: TOTAL OUTSTANDING AUTO LOANS



Source: Equifax, TD Economics.

CHART 10: SUBPRIME AUTO DELINQUENCY RATES ACROSS OIL PRODUCING STATES ARE TRENDING HIGHER



Source: Equifax, TD Economics.

conditions. This has been a contributor to the increase in the FSI over the last year and a continuation in delinquency rates across lower quality auto loans has the ability to push the FSI higher via a further widening of ABS spreads.

FSI inching towards stress

The risks to both the American and global economy have increased over the last year. Fears of slowing growth in China, Fed policy, and more recently Brexit have all taken leading roles in producing volatility. The increased frequency of volatility has made the assessment of global financial stability all the more challenging. The TD Economics U.S. Financial Stress Index makes this evaluation easier. By gathering a range of financial indicators, we can quickly determine if the malignant risks in the financial system have evolved into a systemic problem. In addition to the international risks that can appear in the index, we have highlighted the main domestic risks that could be cause for concern. Specifically, CRE valuations, non-investment grade corporate debt, and sub-prime auto lending. These risks have the potential to evolve into headwinds for financial markets and the overall U.S. economy. The FSI is built to track this evolution and measure whether oscillating financial risks are growing into something bigger. As of this writing, the FSI is showing that the balance of risk remains at comfortable levels. The removal of monetary accommodation and regulatory changes have pushed the index higher over recent months, though not enough to signal immanent stress. That said, markets will eventually be tested by new headwinds and when that happens, we will be better able to determine if the subsequent stress will force a reassessment of growth - or whether it is just another blip on the radar.

Box: Details of the FSI

The TD Economics FSI incorporates a set of 12 daily U.S. financial time series: three measures of short-term credit and liquidity risk; three corporate bond spreads; two measures of market volatility; and three ABS and MBS spreads. Each of the 10 credit spreads were included in the index as a way of capturing either credit and/or liquidity risk as well as flight to safety (see table). The VIX and MOVE capture volatility across U.S. equities and Treasuries, respectively.

The FSI is standardized such that a reading of 0 implies normal or average levels of financial market stress, while levels above and below 0 reflect higher and lower levels of stress, respectively. Non-zero readings should be interpreted as the number of standard deviations from the mean. For example, a reading of +1 (-1) would imply a current level of stress in U.S. financial markets that is +1 (-1) standard deviation above (below) normal or average levels.

The FSI is constructed using Principal Component Analysis (PCA), which is a method of extracting factors responsible for the co-movement of a group of variables. Because all indicators included in the FSI are measures of market stress, the underlying assumption is that the primary factor influencing the co-movement across the 12 indicators is financial market stress. By extracting this factor (the first principal component) we are able to create an index with a useful economic interpretation.

In terms of modelling specifics, the estimation procedure used by TD Economics is very similar to that used by the St. Louis Fed's FSI. As a first step, each of the data series are "de-meaned" then divided by their respective sample standard deviations. For the purpose of the FSI, the sample period used for the estimation is 01/10/1997-09/20/2016 (current period). After de-meaning, all variables are expressed in the same units, and the method of principal components can be used to calculate the coefficients of each of the loadings included in the FSI. The estimated coefficients are then scaled such that the standard deviation of the first principal component is equal to 1. Using the scaled coefficients, each is then multiplied by its respective de-meaned series, creating a normalized version of the FSI. The table above reports the adjusted coefficients for each of the respective variables. It should also be noted that because each of the series have been standardized, the coefficient of each variable represents the impact of a 1 standard deviation change in that respective FSI variable.

As new information is released over time, it will be incorporated into the FSI estimation. This implies that the reported estimated coefficients here may change in value over time. However, given that the FSI is estimated over a relatively large sample size – capturing a few different business cycles – implies that current parameter estimates are fairly robust, and should not change drastically as we incorporate new information.