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The Increasing Default Risk of U.S. Treasuries Securities Due to the Financial Crisis Srinivas Nippani and Stanley D. Smith

Abstract: We examine the impact of the current financial crisis on long-term U.S. Treasury yields by testing the impact of a series of events from December 2007 to March 2009 on the spread between 10-year United States Dollar (USD) London Interbank Offered Rate (LIBOR) swap and 10-year U.S. Treasury (constant maturity) rates to measure risk associated with Treasuries. Controlling for the liquidity of the two markets, the default risk of the swap, and the net foreign purchases of Treasury securities, we find that 13 of the tested 20 events have significantly negative coefficients. We conclude that the lower spread is consistent with greater default risk for U.S. Treasury securities.

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The Increasing Default Risk of U.S. Treasuries Securities Due to the Financial Crisis

Srinivas Nippani and Stanley D. Smith

I. Introduction

As the U.S. government and the Federal Reserve (Fed) have taken actions to deal with the current financial crisis, they have taken actions that have increased the default risk of U.S. Treasury securities (Treasuries). Examples include the Troubled Asset Relief Program (TARP), the Term Auction Facility (TAF), Term Securities Lending Facility (TSLF), the acquisition of Bear Stearns by JPMorgan Chase with \$30 billion of Federal Reserve Bank loans, the conservatorship and financial backing of the Federal National Mortgage Association and the Federal Home Loan Mortgage Corporation, financial support for American International Group (AIG), a bailout of Citigroup, and a bailout of Bank of America.

The purpose of this paper is to address this increasing risk of Treasuries due to greater government involvement in the financial markets involving taxpayer money. A common measure of default risk is to use interest rate spreads on securities with comparable characteristics, such as, maturity, liquidity, and taxation. This problem is not easy to address for Treasuries because they are usually used as the benchmark for default risk. They are rated as AAA by the credit rating agencies. For example, if Treasuries are becoming riskier, other AAA-rated and lower-rated securities may also become riskier. Another problem that is particularly difficult is a “flight to quality” situation wherein the prices for Treasuries are bid up and the interest rate on them decreases relative to other comparable securities. As is generally known,¹ this problem is more likely to affect shorter-term securities than longer-term securities. During

¹ “Treasury bill rates are more volatile than Treasury bond rates...” and “Economic events usually have a larger impact on short-term rates than long term rates...” from Ehrhardt, Michael C. and Eugene F. Brigham, *Corporate Finance: A Focused Approach*, 3rd edition (Florence, KY: South-Western Cengage Learning, 2008): p. 295.

the financial crisis, other countries, particularly the United Kingdom and European countries, were also being affected. Therefore, Treasuries could become more risky but still look favorable when compared to other countries where risk may be increasing more. The domestic and foreign demand for an increasing supply of U.S. Treasuries may affect the Treasury rates. Credit default swaps (CDS) on Treasuries are also a direct measure of the default risk but may be limited due to the size of the CDS market relative to the Treasuries market. It is normally assumed the Treasuries would probably never default.

If one checks the *Wall Street Journal*, e.g., April 17, 2009, p. C4, there are two "Benchmark Yields and Rates," the Treasuries yield curve and the London Interbank Offered Rate (LIBOR) swap curve. The LIBOR-swap curve gained prominence when the U.S. government was running surpluses and analysts were worried that the declining amount of Treasuries would affect their use as the benchmark for default risk.²

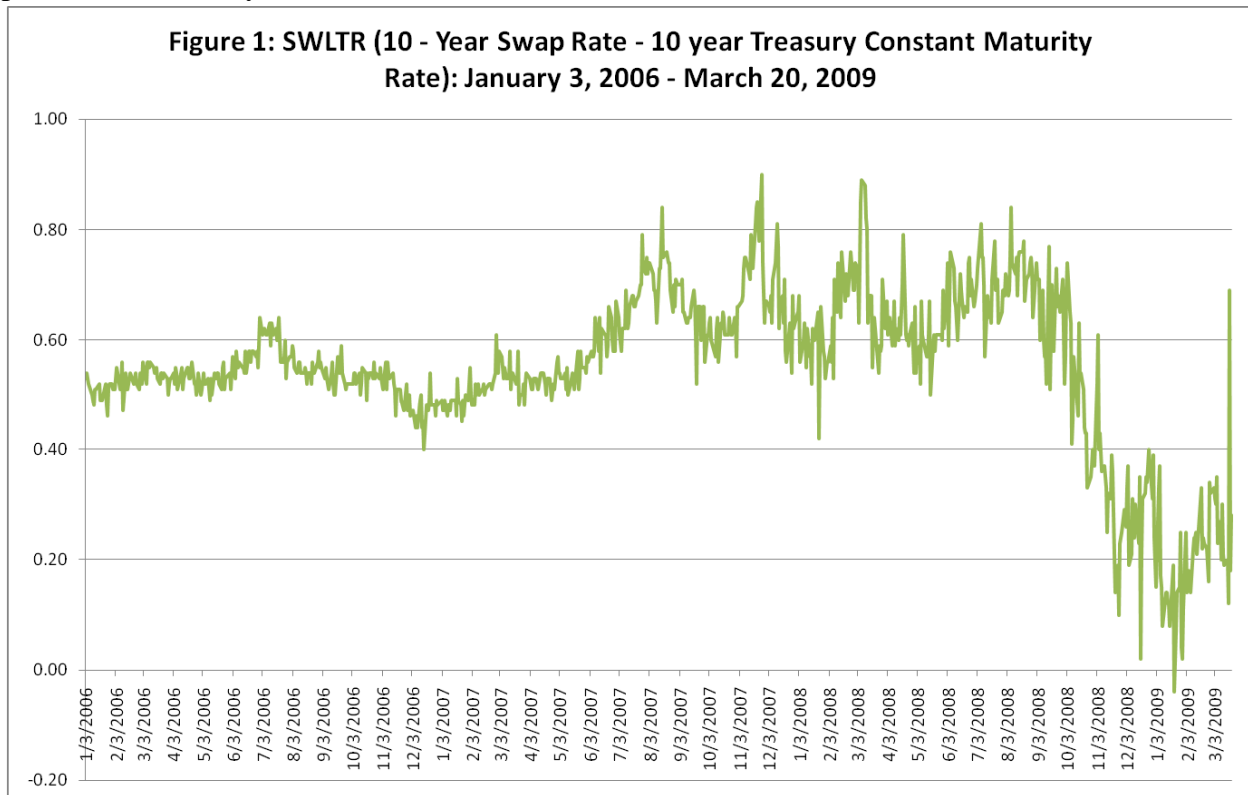
We chose the spread between the 10-year swap and the 10-year U.S. Treasury security (constant maturity) as the measure of the risk associated with the Treasuries.³ Haubrich (2001) discusses how LIBORs include a default risk component but they are a good alternative benchmark. The spread is defined as the rate on the 10-year swap minus the rate on a 10-year Treasuries constant maturity and will hereafter be referred to as SWLTR. See Figure 1 for the behavior of the daily spread, SWLTR. One can see that the SWLTR is well behaved from January 2006 to June 2007. Then it becomes more volatile, and it starts a deep decline around

² For a discussion of the LIBOR swaps and their yield curve, see Haubrich (2001). For example, a rate on a 10-year swap is the rate paid to receive the three-month USD LIBOR rate for 10 years.

³ These rates are found in the Federal Reserve Board of Governors, "Statistical Release H.15: Selected Interest Rates," [H](http://www.federalreserve.gov/releases/h15/update/H)

August 2008. If the Treasuries are becoming more risky, then the normally positive SWLTR will decrease. In other words, as the Treasuries become more risky relative to the 10-year swaps, the change in SWLTR should be negative. The necessary assumptions to make this statement are discussed in section 3, Methodology, where we attempt to control for other factors that may also affect the spread change.

Figure 1: SWLTR. SWLTR is defined as the rate on the 10-year LIBOR swap minus the rate on a 10-year Treasury constant maturity. The chart shows the value of SWLTR for the sample period from January 3, 2006 to March 20, 2009.



Other factors that may affect SWLTR are the increasing supply of Treasuries to finance the various programs. If the supply is greater than demand, then the Treasury rate will increase to attract investors. If the Treasury rate increases more than the swap rate increases, the SWLTR will decrease in a manner consistent with an increase in Treasury risk. As the capital positions for banks improve, the systemic risk component in the swap will decline and the swap rate will

decrease. If the Treasury rate is held constant and the swap rate decreases, the SWLTR will decrease in a manner consistent with an increase in Treasury risk. An increase in the systemic risk of the LIBOR swap relative to Treasury rates will lead to an increase in SWLTR which is consistent with a decrease in Treasury risk relative to the other benchmark, the swap rate. We examine this spread for the period January 3, 2006 to March 20, 2009. We analyze the percentage changes in SWLTR, SWLTRPCH, for 29 events, which due to closeness in time are reduced to 20 test events. Thirteen of the tested 20 events are significantly negative, six events are significantly positive, and the one remaining event is not significant. The overall picture is one of a declining SWLTR and riskier Treasuries. For example, the SWLTR declined from 0.53 on January 3, 2006 to 0.28 on March 20, 2009.

The remainder of the paper is structured in the following way. Section 2 discusses the literature related to the default risk of U.S. Treasury securities. Section 3 provides the methodology. Section 4 provides the empirical results and section 5 provides the summary and conclusions.

II. Literature Review

While it is normally assumed that U.S. Treasury securities never default, history has proved on occasion that this could be wrong. While Treasury securities issued by a sovereign are generally considered to be the closest to being “risk-free,” several sovereigns have defaulted over the past few decades. As mentioned in Dungey, Goodhart and Tambakis (2008), Russia announced its default on Treasury bonds on August 17, 1998. In the case of the United States, where finance textbooks routinely mention that Treasury securities are “risk-free,” the same assumption is used, because it is generally believed that the government can “print” money to

pay the securities. It is also believed that a government can tax its citizens and pay off its debt. However, on closer examination, it is clearly evident that neither of these is a viable option in the long run for the government of a democracy. The first option, if used unwisely can lead to hyperinflation, making paper money worthless, while the use of the second option is limited by the checks and balances that exist in a democracy to counteract high taxes. It is due to these reasons among others, and the fact that the U.S. Treasury defaulted earlier (Zivney and Marcus 1989) and came very close to default a second time (Nippani, Liu and Schulman 2001), that the question of default-free Treasury securities comes into question.

Zivney and Marcus (1989) show that there was a 60 basis point increase in Treasury bill rates at the initial occurrence of a default by the United States Treasury in May, 1979. As they mention, the Treasury blamed the delay on several factors, including the failure of Congress to act in a timely fashion on the debt ceiling legislation and technical difficulties in processing of checks. On another occasion, between mid-October 1995 and March 1996, the Treasury nearly defaulted. This was due to a disagreement between the White House and Congress over the increase of the federal debt limit and as shown by Nippani, Liu and Schulman (2001), the market charged a default risk premium on Treasury bills at this time. In both studies, the workings of the government have at least in part led to the default or potential default.

The potential of Treasury default is also the subject of a more recent study by Liu, Shao and Yeager (2009). They examine whether the financial market charged a default risk premium to the U.S. Treasury securities when the U.S. federal government had approached the debt limits between 2002 and 2006. They show that for the first two of the four occurrences, the market charged a small default risk premium and did not for the last two because the market anticipated

that an agreement would be reached ensuring that there would be no long term standoff. There are also other empirical studies and discussions that lead to Treasury debt being considered risk free. Kotlikoff (2006) asks the question “Is the United States Bankrupt?” He mentions the study of Gokhale and Smetters (2005), which shows that the fiscal gap for the United States is \$65.9 trillion. He mentions that this is five times the gross domestic product (GDP) of the country and twice the size of the national wealth. In his discussion of Kotlikoff’s (2006) study, Thakor (2006) makes several interesting points mentioning this about the discussion of the fiscal gap by Kotlikoff (2006):

Although I do not agree with the implicit assertion that the U.S. fiscal gap puts the country in the same position as a bereft and destitute firm that is bankrupt and on the verge of liquidation, I do agree that the current state of affairs is alarming and the problem needs to be tackled sooner rather than later.

And:

My belief is that the fiscal crisis identified by this paper will become so painful at some point that the political will to renegotiate these extravagant promises and diminish the nation’s contingent liabilities is likely to emerge.⁴

When Thakor (2006) talks about renegotiation of the promises or changing the rules, he mentions that the U.S. government would do this should the situation arise.

To sum up, the U.S. government has already defaulted once (Zivney and Marcus 1989), came close to a default again (Nippani, Liu and Schulman 2001), and had to increase the debt limit several times in the recent past so that the market now takes these increases for granted (Liu, Shao and Yeager 2009). In addition, there are questions being raised as to whether the country is already bankrupt (Kotlikoff 2006); some commentators now think that the U.S.

⁴ See Thakor, Anjan (2006), “Commentary: Is the United States Bankrupt?” *Federal Reserve Bank of St. Louis Review*, 88 (4), 251-257.

government might renegotiate its commitments (Thakor 2006). In addition, we have information that suggests that LIBOR swaps are the most likely replacement for Treasury bonds as a financial benchmark (Haubrich 2001). All of these suggest that not only is Treasury debt no longer default risk-free, but it is also not considered so by the market, due to increased debt levels.

At the present time, there are several efforts being undertaken by both the legislative and executive branches of the U.S. government to help the economy in the current financial crisis. As has been shown recently, there have been occasions when the legislature and the executive branch disagreed, *albeit* temporarily, on the form and substance of the help that the government would provide to the various industries impacted by the current financial crisis. This major crisis is unprecedented since the 1930s and therefore it is important to see if it has impacted the Treasury debt obligations, due to several reasons:

- (1) the government is taking an increasing role in helping and bailing out industries and companies, thus increasing the potential amount of future taxpayer money invested in this process.
- (2) The financial crisis is longer and definitely deeper than most people have experienced for a long time, thus requiring sustained attention by legislators and the executive branch and forcing the government to help more than it normally would.
- (3) As is generally known, increased debt can only be had at a higher risk, demanding a higher price and cost to taxpayers.

This situation has also been discussed both in the national and international press over the past couple of years. As Guerrero, Van Duyn and Pimlott (2008)⁵ mention:

The U.S. is at risk of losing its top-notch triple-A credit rating within a decade unless it takes radical action to curb soaring healthcare and social security spending, Moody's, the credit rating agency said yesterday.

The warning over the future of the triple-A rating – granted to U.S. government debt since it was first assessed in 1917 – reflects growing concerns over the country's ability to retain its financial and economic supremacy.

In a more recent announcement,⁶ Moody's confirms this gloomy outlook:

The United States, which posted a record deficit in the last fiscal year, may lose its Aaa-rating if it does not reduce the gap to manageable levels in the next 3-4 years, Moody's Investors Service said on Thursday.

The U.S. government posted a deficit of \$1.417 trillion in the year ended September 30 as the deep recession and a series of bank rescues cut a gaping hole in its public finances. The White House has forecast deficits of more than \$1 trillion through fiscal 2011.

"The Aaa rating of the U.S. is not guaranteed," Steven Hess, Moody's lead analyst for the United States said in an interview with Reuters Television.

"So if they don't get the deficit down in the next 3-4 years to a sustainable level, then the rating will be in jeopardy."

Our motivation for this paper stems from the aforementioned reasons. The financial disturbances studied in the earlier works of Zivney and Marcus (1989) and Nippani, Liu and Schulman (2001) were smaller than the current financial crisis by comparison. If those two events did impact Treasury yields, it is highly likely that these events, which are potentially more serious, would impact them as well.

⁵ See Guerrero, F., Van Duyn, A., and Pimlott, D. (2008), "U.S. risks losing triple-A rating," *Financial Times* January 11, [Hhttp://www.ft.com/cms/s/0/6abff5da-bff8-11dc-8052-0000779fd2ac.html?nclick_check=1](http://www.ft.com/cms/s/0/6abff5da-bff8-11dc-8052-0000779fd2ac.html?nclick_check=1)H.

⁶ See "Reducing deficit key to U.S. rating: Moody's" published by Reuters, October 22, 2009.

[Hhttp://www.reuters.com/article/idUSTRE59L1N620091022](http://www.reuters.com/article/idUSTRE59L1N620091022)**H**.

For examining the impact of the current economic crisis on Treasury default possibility, we examine the spread between 10-year swap minus the rate on a 10-year Treasuries constant maturity.⁷ Haubrich (2001) mentions in his work that the spreads between swap rates and Treasury bonds are becoming a closely watched indicator of the market's view of macroeconomic risk. He also mentions that there is a significant body of opinion that is looking at swaps as the most likely replacement for Treasuries as a financial benchmark, should budget surpluses continue to grow. He further mentions that they have already become the standard for pricing many corporate bonds. Based on his work, it appears that the spread between the swap rate which is being looked at as a long term substitute for Treasury yields would be a good benchmark to compare Treasury yields. We therefore use the percentage change in the spread during the event window, SWLTRPCH, to examine the impact of the major events over the study period on Treasury yields.

Credit default swaps on Treasury bonds would also be a measure of default risk. A CDS price is the annual cost of insuring a bond against default if the U.S. failed to adhere to its debt agreements. The CDS prices on U.S. Treasury bonds and the debt of other industrialized countries have increased greatly, according to various reports over time. For example, a basis point on a CDS contract protecting \$10 million of debt from default is equivalent to \$1,000 per year. Shanahan and Moses (2008) mention that a 10-year CDS on Treasuries was .02% or two basis points in July 2007, before the credit crisis. Mandaro (2009) reports the price has increased consistently during the crisis, reaching a new record of 97 basis points on March 10, 2009.

⁷ Although thirty-year swaps are available during the sample period, thirty-year treasury rate information was not. Although there are twenty-year treasury rates available, there are no twenty-year swaps.

Fidler and Shah (2009) on May 22, 2009 report that the five-year U.S. Treasury CDS price had decreased to 37.5 basis points, even though the financial markets were worried about the default risk of Treasuries as related to S&P's expected rise in debt to GDP from 44 percent in 2008 to 77 percent in 2013. These changes in CDS prices demonstrate that all levels of default risk, including Treasury securities, have gone through the repricing of credit risk we have observed in all of our debt markets over the past few years. The continuous repricing of credit risk is a major function of our capital markets. These CDS price changes, particularly the increases up to March 2009, are consistent with our measure, the declining SWLTR, in reflecting an increase in the default risk of Treasuries during the sample period. McDonald (2008) reports the quantity of these CDS have been given as relatively small, with a \$4 billion notional gross and a little over \$1 billion net. Given the relatively small size of the CDS market, we chose to use the SWLTR measure since it is based on two widely accepted measures, 10-year Treasury yields and the 10-year LIBOR-swap rate.

III. Methodology

The purpose of the paper is to examine if the yield of the Treasury securities has gone up due to an increase in default risk. Many events that have occurred starting December 12, 2007, up to March 18, 2009 have increased the commitment of public funds. All of these events have potentially increased long-term Treasury risk and thereby could increase Treasury yields. A list of the events is given in Table 1 below.

TABLE 1: CHAIN OF EVENTS IMPACTING TREASURY DEBT

The chain of events that can potentially increase Treasury risk is given below. All of the events below have been obtained from the press releases section under www.federalreserve.gov.

Event Number	Date	Event
1	12/12/07	The Federal Reserve Board announced the Term Auction Facility.
2	03/11/08	The Federal Reserve Board announced the Term Securities Lending Facility.
3	03/16/08	The Federal Reserve Board voted to authorize the Federal Reserve Bank of New York to create a Primary Dealer Credit Facility and to decrease the primary credit rate from 3-1/2 percent to 3-1/4 percent.
4	03/17/08	Wall Street's fifth-largest bank, Bear Stearns, is acquired by JPMorgan Chase for US\$240m in a deal backed by US\$30bn of central bank loans.
5	08/1/08	U.S. mortgage lender, IndyMac Bancorp, files for Chapter 7 bankruptcy.
6	09/07/08	Fannie Mae and Freddie Mac Conservatorship Announced.
7	09/14/08	The Federal Reserve Board announced that the collateral eligible to be pledged at the Primary Dealer Credit Facility has been broadened and the collateral for the Term Securities Lending Facility also has been expanded.
8	09/15/08	After days of searching frantically for a buyer, Lehman Brothers files for Chapter 11 bankruptcy protection, becoming the first major investment bank to collapse since the start of the credit crisis. U.S. bank Merrill Lynch agrees to be taken over by Bank of America for US\$50bn.
9	09/16/08	The Federal Reserve Board authorized the Federal Reserve Bank of New York to lend up to US\$85bn to the American International Group.
10	09/19/08	The Federal Reserve Board approved extending loans to banking organizations to finance their purchases of high-quality asset-backed commercial paper from money market mutual funds.
11	09/21/08	The Federal Reserve Board authorized the Federal Reserve Bank of New York to extend credit to Goldman Sachs and Morgan Stanley against all types of collateral that may be pledged at the Federal Reserve's primary credit facility for depository institutions or at the existing Primary Dealer Credit Facility.
12	09/25/08	In the largest bank failure yet in the U.S., Washington Mutual (WaMu), the giant mortgage lender which had assets valued at US\$307bn, is closed down by regulators and sold to JPMorgan Chase.

13	10/03/08	<p>The Troubled Asset Relief Program is enacted.</p> <p>Wells Fargo announces it is set to buy Wachovia for US\$15.1bn, which scuppers an earlier U.S. government-backed rescue deal in which Citi would buy Wachovia's banking arm for US\$2.2bn.</p>
14	10/08/08	<p>Six central banks - the Bank of Canada, the Bank of England, the European Central Bank, the Federal Reserve, Sveriges Riksbank, and the Swiss National Bank - announce reductions in policy interest rates.</p> <p>The Federal Reserve agrees to inject up to an additional US\$37.8bn into AIG.</p>
15	10/13/08 10/14/09	<p>Spanish banking group Santander agreed to buy the rest of U.S. banking group Sovereign Bancorp for \$2.4bn, a tenth of the price agreed when it took a minority stake three years ago.</p> <p>The U.S. is expected to commit US\$250bn, out of the US\$700bn rescue package agreed earlier this month, to a recapitalization program, providing a temporary sovereign guarantee for bank borrowing and expand depositor protection. About half the money would be invested in bigger U.S. banks including Bank of America, JPMorgan Chase, Citi, Wells Fargo, Goldman Sachs and Morgan Stanley - with the largest lenders receiving as much as US\$25bn.</p> <p>The Federal Reserve has approved a \$12bn takeover of Wachovia and its subsidiaries by Wells Fargo, beating out Citi.</p> <p>Treasury announced a voluntary capital purchase program, The Federal Reserve announced details of its Commercial Paper Funding Facility program.</p>
16	10/31/08	<p>The U.S. economy shrank at an annualized rate of 0.3% between July and September, according to figures from the Commerce Department. The Federal Reserve has cut its key interest rate from 1.5% to 1% in order to stave off recession.</p> <p>American International Group (AIG) has raised US\$20.9bn from a new Federal Reserve lending facility, which is designed to boost the commercial paper market, to repay part of a Fed loan. As of Wednesday, AIG owed the U.S. government \$83.5bn, down from \$90.3bn a week ago.</p>
17	11/18/08	<p>Citigroup has announced plans for about 52,000 new job cuts, on top of 23,000 cuts already made this year. It is estimated that the bank has lost more than US\$20bn in the past year because of the</p>

		global financial crisis.
18	11/19/08	The three biggest U.S. carmakers - Ford, General Motors and Chrysler - have asked U.S. Congress for a \$25bn bail out. The bosses told a Senate hearing that without the rescue package their firms risked collapse and warned of broader risks to the U.S. economy.
19	11/21/08	Citigroup's crisis deepened as its shares continued to slump despite a planned investment of about US\$250m by Prince Alwaleed Bin Talal, its largest individual investor. The 26.4% fall in shares, which closed at US\$4.71 in New York on Thursday 20 November, prompted Citi's directors and executives to look at strategic options, including selling part or all of the company.
20	11/25/08	The U.S. government agrees a bailout of Citi by guaranteeing up to US\$306bn in problematic assets and injecting US\$20bn in capital to restore confidence in the bank. At the same time, the U.S. Federal Reserve escalated its efforts to revive the financial system, pledging US\$800bn to bolster markets for loans to homebuyers, consumers, students and small businesses.
21	12/17/08	The U.S. Federal Reserve has slashed interest rates from 1% to virtually zero, saying it would target a record low interest rate of between zero and 0.25%.
22	12/30/08	The U.S. Treasury department unveiled up to US\$6bn in aid for GMAC, the financial services group which is critical to part-owner General Motors' turnaround, after the Fed gave GMAC the green light to become bank holding company.
23	1/12/09	The sharp slowdown in the U.S. economy will push the federal budget deficit to more than US\$1 trillion, the non-partisan Congressional Budget Office says. More U.S. workers lost jobs last year than in any year since World War II, with employers axing 2.6 million posts and 524,000 in December alone. The U.S. jobless rate rose to 7.2% in December, the highest in 16 years.
24	1/16/09	Citigroup announces plans to split in two, as it reported a quarterly loss of US\$8.29bn (£5.6bn). It will realign into two new firms, Citicorp and Citi Holdings. Citicorp will handle the company's traditional banking work, while Citi Holdings will take on the firm's riskiest investment assets. Bank of America will receive US\$20bn (£13.4bn) in fresh U.S.

		government aid and US\$118bn worth of guarantees against bad assets.
25	1/19/09	The U.S. Senate has released the remaining US\$350bn of the TARP funds. Bond insurers Ambac Financial Group and MBIA have asked for some of the money arguing that a capital infusion from the government would help revitalize public-debt markets.
26	1/29/09	The U.S. House of Representatives has passed President Barack Obama's US\$819bn economic stimulus package. The bill would cut taxes for people and businesses by US\$275bn, while pumping more than US\$540bn into a range of initiatives including road and bridge repair, increased unemployment benefits, investment in new technology and renovations to 10,000 schools.
27	2/20/09	U.S. banking shares hit their lowest level since 1992 as fears mounted that the government would be forced to nationalize a key institution, according to the <i>Financial Times</i> . Further heavy selling of key names - Bank of America and Citigroup were once again among the worst performing, down 14% to US\$3.93 and 13.8% to US\$2.51, respectively - helped push the Dow Jones Industrial Average to its lowest level in six years.
28	3/3/09	American International Group (AIG) revealed a US\$61.7bn quarterly loss - the largest in U.S. corporate history - and pointed to the next trouble spot for the financial sector by reporting large write-downs in commercial real estate.
29	03/18/09	Fed announced it is purchasing up to an additional \$750 billion of agency mortgage-backed securities, bringing its total purchases of these securities to up to US\$1.25 trillion this year, and to increase its purchases of agency debt this year by up to us\$100bn to a total of up to US\$200bn. Moreover, to help improve conditions in private credit markets, the Committee decided to purchase up to US\$300bn of longer-term Treasury securities over the next six months.

As mentioned earlier, we use the spread between 10-year swap rate and 10-year constant maturity Treasury bond rate to examine the impact of increased Treasury risk. We look for changes in the spread to measure the impact of increased Treasury risk. There have been studies in the literature that examined the potential short-term impact on Treasury default. Nippani, Liu

and Schulman (2001) and Liu, Shao and Yeager (2009) use the spread between Treasury bills and commercial paper to examine the impact on Treasury default risk. Both studies look at short-term potential Treasury default. In our study, we are not looking at short-term imminent default but at long-term potential⁸ increases in default risk. Hence, we chose to use the 10-year swap and 10-year Treasury spread.

There are several points made by Haubrich (2001) that made the swap-treasury spread the ideal choice for this study. The first is that the market is already looking at this spread as a major indicator of macroeconomic risk. The second is that swaps are at least, in the opinion of some, the most likely replacement for Treasuries, which implies that they are possibly the future standard as far as low default risk rates are concerned. Finally, they already seem to be on their way to replacing Treasuries as a standard for pricing corporate bonds. Unlike the commercial paper-Treasury bill spread based on short-term rates, this paper examines the potential default in long-term rates. At the same time, it is also consistent with the two studies mentioned above, in that the use of the spread based on a 10-year maturity controls for term to maturity.

Figure 1 shows the behavior of SWLTR, January 3, 2006 to March 20, 2009. To assist the examination of SWLTR during the sample period, the SWLTR at the beginning of the event on the trading day before the event, SWLTRBeg, and the SWLTR at the end of the event(s), SWLTREnd, and the changes during the event periods, SWLTRCH, are provided in Table 2.

⁸ There is definite evidence that the market is also focusing on potential of long-term rather than short-term default. In the Guerrera et al (2008) article, it is reported that Steven Hess, Moody's lead analyst for the U.S., told the *Financial Times* that in order to protect the country's top rating, future administrations will have to rein in healthcare and social security costs. "If no policy changes are made, in 10 years from now we would have to look very seriously at whether the U.S. is still a triple-A-credit" he said.

TABLE 2.

The events correspond to the events listed in Table 1. SWLTR is the spread calculated as the 10-year swap rate minus the 10-year Treasury constant maturity rate. SWLTRBeg is the SWLTR before the event on the trading day before the event and SWLTREnd is the SWLTR at the end of the event. SWLTRCH is the SWLTRBeg minus SWLTREnd.

<u>EVENT</u>	<u>SWLTRBeg</u>	<u>SWLTREnd</u>	<u>SWLTRCH</u>
VENT1	0.81	0.62	-0.19
EVENT2	0.88	0.80	-0.08
EVENT3 TO 4	0.68	0.55	-0.13
EVENT5	0.68	0.68	0.00
EVENT6	0.60	0.60	0.00
EVENT7 TO 12	0.52	0.65	0.13
EVENT13	0.68	0.65	-0.03
EVENT14	0.63	0.45	-0.18
EVENT15	0.57	0.53	-0.04
EVENT16	0.39	0.52	0.13
EVENT17 TO 19	0.31	0.19	-0.12
EVENT20	0.19	0.23	0.04
EVENT21	0.35	0.21	-0.14
EVENT22	0.31	0.24	-0.07
EVENT23	0.08	0.14	0.06
EVENT24 TO 25	0.12	-0.04	-0.16
EVENT26	0.04	0.11	0.07
EVENT27	0.24	0.22	-0.02
EVENT28	0.33	0.30	-0.03
EVENT29	0.12	0.18	0.06

Consistent with the graph of SWLTR, the general trend is down during the event periods. The data illustrate some problems in specifying an empirical model. The mean and median for SWLTR are both 0.55, with a minimum of -0.04 and a maximum of 0.90 and a standard deviation of 0.14 for 803 observations. If we use SWLTR as the dependent variable, the dummy for the event will reflect the difference between the SWLTR during the event and the mean value. For example, the average value of SWLTR during the two-day event period for event 1 would be 71.5. The difference between 71.5 and 55 is 16.5, a positive coefficient; however, the change for the event is -0.19. In a regression (not reported here for brevity) that used SWLTR as the dependent variable, with no other explanatory variables other than the events, all the coefficients for events 1 to 13 were positive and significant and all the coefficients for events 14 to 29 were negative and most of them were significant. In other words, the pattern of these coefficients demonstrate that SWLTR as a dependent variable would just measure how different the level of SWLTR is from the mean of SWLTR on that date. The problem with this approach is that it does not allow us to examine the impact of individual events. In other words, did the event cause the SWLTR to change due to that event?

The change in SWLTR, SWLTRCH, is a better measure of the effect on SWLTR during the event period. However, it has a problem, too. For example, in Table 2 the SWLTRCH for events 13 and 28 are both -0.03 but this change is from a different level. In event 13, the -0.03 represents a decrease of 4.41% of the 0.68 at the beginning of the event window, while in event 28 the same -0.03 represents a decrease of 9.09% of the 0.33 at the beginning of the event window. To solve this problem the percentage change in SWLTR, SWLTRPCH, is used as the proxy for the relative change in the risk spread, SWLTR. This measure is similar to using the

relative return in event studies for stock prices. If an event has an effect on SWLTRPCH, then the coefficient for that event should be statistically significantly different from zero.

Our measure known as *SWLTRPCH* is calculated as:

$$SWLTRPCH = ((SWLTR_t / SWLTR_{t-1}) - 1) \quad (1)$$

In the above equation, $SWLTR_t$ refers to the spread between the 10-year swap rate and the 10-year constant maturity Treasury rate on day t , and $SWLTR_{t-1}$ refers to the spread for the previous trading day.⁹ For examining the impact of the chain of events on Treasury risk, we evaluate percentage changes in the spread, *SWLTRPCH*. A significant change in the daily spread could mean increased or decreased risk of Treasury securities.

For testing the impact of increased risk of Treasury securities, we use a regression model with dummy variables representing the events and other non-dummy variables to control for other factors related to a changing spread. The equation used in the study is defined as:

$$\begin{aligned} SWLTRPCH_t = & \beta_0 + \beta_1 \text{Event1} + \beta_2 \text{Event2} + \beta_3 \text{Event3to4} + \beta_4 \text{Event5} + \beta_5 \text{Event6} + \\ & \beta_6 \text{Event7to12} + \beta_7 \text{Event13} + \beta_8 \text{Event14} + \beta_9 \text{Event15} + \beta_{10} \text{Event16} + \beta_{11} \text{Event17to19} + \\ & \beta_{12} \text{Event20} + \beta_{13} \text{Event21} + \beta_{14} \text{Event22} + \beta_{15} \text{Event23} + \beta_{16} \text{Event24to25} + \beta_{17} \text{Event26} + \\ & \beta_{18} \text{Event27} + \beta_{19} \text{Event28} + \beta_{20} \text{Event29} + SPRET_t + LNTCH_t + SWSRCH_t + BLSCH_t + \\ & \mu_t \end{aligned} \quad (2)$$

In the above equation the dependent variable, $SWLTRPCH_t$, is calculated as the percentage change in the spread between swap rates and Treasury rates as seen in equation 1.

The numbers in the event windows were very volatile on some occasions such as events 21 and

⁹ The daily rates were obtained from the website of www.federalreserve.gov.

29. For example in event 21, SWLTR on days -1, 0 and +1 were 0.35, 0.02, and 0.21, respectively. These numbers yield a SWLTRPCH of -94.29 percent on day 0 and +950 percent on day 1, which gives us an effect for the event 21 dummies of $(950 - 94.29)/2 = 427$ percent. This is not a good picture of what occurred because SWLTR actually decreased 40 percent during the two days, i.e., $(.21/.35)-1 = -.40$. For example in event 29, SWLTR on days -1, 0 and +1 were 0.12, 0.69, and 0.18, respectively. These numbers gives a SWLTRPCH of 475 percent on day 0 and -73.91 percent on day 1 which gives us an effect for the event 21 dummies of $(475 - 73.91)/2 = 200.55$ percent. This is not a good picture of what occurred because SWLTR actually increased 50 percent during the two days, i.e., $(.18/.12)-1 = .50$. To take into account the changes during the window period, we have calculated the average change over the window for the event days for $SWLTRPCH_t$ for those event days. Only the event day numbers have been changed because it is a more accurate representation of what happened during the window.

The independent variables are the event dummies.¹⁰ For example, Event 1, the announcement of the Term Auction Facility, took place on December 12, 2007. Thus Event 1 takes a value of 1 for the day of the announcement and the trading day immediately afterwards. On other days it takes a value of zero. The period covered for examining the macroeconomic impact is from January 1, 2006 to March 20, 2009, a period of over three years including 803 observations. The regression results are adjusted for autocorrelation and heteroskedasticity by using the Newey-West (1987) method. We needed a long pre-event period since the series of event periods is long. Event 1 occurred on December 12, 2007 and Event 29, the last event occurred on March 18, 2009. In case an event occurred on a non-trading day, the first two trading

¹⁰ See Cornett and Tehranian (1990) for a similar approach.

days following the announcement are taken as event days. In the case of several events, the trading days overlapped. As it would be hard to distinguish the impact of overlapping events, we joined them together. As all of the events increased macroeconomic risk and were expected to increase Treasury risk, it is possible to do this. Thus Events 3 and 4 are included as one dummy variable, and Events 7 to 12, Events 17 to 19 and Events 24 to 25 are all included as one variable each since the days of the events tend to overlap. We hypothesize that all the twenty nine events will increase Treasury risk and therefore cause the $SWLTRPCH_t$ to decrease. They are all expected to have significantly negative coefficients.

In addition, we have four control variables included in the regression. The first three controls are similar to the variables used in the Liu et al (2009) study. For $SWLTRPCH_t$ to appropriately proxy the default risk for the Treasuries, we must control for the default risk of the swap rate and the liquidity risk for the swap rate and the Treasuries. The first control variable is the daily return on the S&P 500 Index, $SPRET_t$. This variable was used by Liu et al to proxy the default risk for commercial paper. We also use it to proxy the default risk for the swap rate. As Bonfirm (2009) suggests, a high equity return signals a stronger economy. The stronger economy should reduce the probability of default for both borrowers and the banks in the LIBOR swap market. A positive change should reflect a lower default risk in the banking sector and a lower default risk associated with United States Dollar (USD) LIBOR. If the default risk of LIBOR decreases and has no effect on Treasuries, the $SWLTRPCH_t$ should be negative; therefore, we expect a negative coefficient on this variable.¹¹

¹¹ We wish to thank an anonymous referee for also suggesting this factor. The daily return on the KBW Index, a capitalization-weighted index composed of 24 geographically diverse stocks representing national money center banks and leading regional institutions, was also tried as a measure of default risk in the USD LIBOR market. It had

The second control variable is LNTCH, defined as the change in the natural log of the primary dealer transactions by security - U.S. government securities coupon securities due in more than 6 years but less than or equal to 11 years outright transactions. This variable controls for the liquidity effects in the 10-year Treasury securities. The transaction data include all Treasuries in the More Than 6 Years but Less Than or Equal to 11 Years maturities, not just the 10-year Treasury securities.¹² The data are reported in millions as daily averages for the week ended each Wednesday; therefore, we back-fill the weekly average value for each business day of the preceding week. This is consistent with the study of Liu et al (2009), in which they used a similar variable based on short-term Treasuries. We expect higher Treasury transactions to indicate more liquidity, depressing Treasury yields and increasing SWLTR; therefore, we expect the coefficient on LNTCH to be positive.

The third control variable is SWSPRCH, the change in the spread, (ask-bid), for the 10-year LIBOR swap at the end of the trading day.¹³ This spread variable is a proxy for the liquidity of the 10-year swap. As SWSPR decreases, it indicates that the liquidity is increasing. As the liquidity increases, we expect the swap rate to decrease. The lower swap rate would lead to a smaller SWLTR; therefore, we expect SWSPRCH to have a positive coefficient.

The fourth control variable is BLSCH, the change in the foreign purchases or buys of U.S. Treasury securities minus the foreign sales.¹⁴ The major impact by foreign buyers and

a 0.80 correlation coefficient with $SPRET_t$ which caused a multicollinearity problem. However, the daily return on the KBW Index was not significant when added to the current model or when it was substituted for $SPRET_t$.

¹² The historical primary dealer data can be found at [Hwww.newyorkfed.org/markets/statrel.html](http://www.newyorkfed.org/markets/statrel.html)H.

¹³ This information was provided by Xignite ([Hhttps://www.xignite.com/xMoneyMarkets.aspx](https://www.xignite.com/xMoneyMarkets.aspx)H).

¹⁴ See [Hhttp://www.ustreas.gov/tic/s1_99996.txt](http://www.ustreas.gov/tic/s1_99996.txt)H.

sellers should be reflected in the difference in purchases and sales; therefore, we introduce a variable based on the amount, Buys Less Sales or BLS. We use the change in BLS or BLSCH.¹⁵ This information is provided on a monthly basis; therefore, we back-fill the monthly average value for each business day of the appropriate month. If BLSCH is positive we would expect the greater net foreign demand for Treasuries to increase the price and lower the yield on Treasuries. Assuming no effect on the swap rate, the lower Treasury yield would lead to a greater SWLTR; therefore, we expect BLSCH to have a positive coefficient.

Descriptive statistics for the dependent variable, SWLTRPCH, and the control independent variables are provided in Table 3.

TABLE 3. Descriptive Statistics for Variables, SWLTR, 10 YR SWAP, and 10 YR TREASURY and the control variables used in the regression.

<u>Statistic</u>	<u>SWLTPCH</u>	<u>SWSRCH</u>	<u>LNTCH</u>	<u>BLSCH</u>	<u>SPRET</u>	<u>SWLTR</u>	<u>10 YR SWAP</u>	<u>10 YR TREASURY</u>
Mean	0.524	-1.44E-23	-0.00017	140	-0.05785	0.549589	4.8033	4.253711
Median	0	0	0	4843	0.08	0.55	5.07	4.53
Maximum	175	8.00E-05	1.181945	40368	10.79	0.9	5.85	5.26
Minimum	-275	-8.00E-05	-0.7143	-74802	-9.03	-0.04	2.22	2.08
Std. Dev	21.868	8.81E-06	0.109928	27346	1.670614	0.144362	0.788441	0.715192
Number of observations	803	803	803	803	803	803	803	803

¹⁵ We wish to thank an anonymous referee for suggesting this variable.

To summarize the model, we hypothesize the event dummy variables will have negative coefficients, $SWSPRCH_t$, $LNTCH_t$, and $BLSCH_t$ will have positive coefficients, and $SPRET_t$ will have a negative coefficient. The empirical results are presented in the next section.

IV. Empirical Results

The results are presented in Table 4. The expected coefficients on all the event independent variables are hypothesized to be negative. Thirteen of the 20 tested events were negative and significant. EVENT1 (Term Auction Facility), EVENT2 (Term Securities Lending Facility), EVENT 3TO4 (Primary Dealer Credit Facility and JPMorgan purchase of Bear Stearns), EVENT 13 (Troubled Asset Relief Program is enacted), EVENT 14 (Six central banks announce rate cuts and Fed agrees to provide more funds for AIG), EVENT 17TO19 (Citigroup was in crisis and Ford, General Motors and Chrysler asked Congress for a bailout), EVENT 21 (the Federal Reserve slashed rates to near zero), EVENT 22 (Treasury unveiled aid for GMAC), EVENT 24TO25 (Citigroup and Bank of America crises continue and remaining \$350 billion of TARP funds released) , EVENT 27 (banking shares hit lowest level of stock prices since 1992), and EVENT 28 (AIG reveals \$61.7 billion quarterly loss) are negative and significant at the .01 level. EVENT5 (IndyMac files for bankruptcy) and EVENT15 (U.S. expected to commit to recapitalization of largest bank holding companies and announced details of Commercial Paper Funding Facility) are negative and significant at the 0.10 level. EVENT6 (Conservatorship of Fannie Mae and Freddie Mac announced) was negative but not significant. Six events were positive and significant at the 0.01 level. EVENT7TO12 (Lehman Brothers files for bankruptcy, Merrill Lynch agrees to be takeover by Bank of America, Federal Reserve announces loan of up to \$85 billion to AIG, Federal Reserve authorized to extend credit to Goldman Sachs and

Morgan Stanley, WaMu closed and sold to JPMorgan), EVENT16 (economy shrinking at an annual rate of 0.3%, a cut in the Federal Funds target, and AIG decreasing the loan amount), EVENT20 (U.S. government agrees to bailout of Citigroup), EVENT23 (bad economic statistical results), EVENT26 (U.S. House of Representatives passed economic stimulus package), and EVENT 29 (Federal Reserve announces quantitative easing program) are positive and the market appears to have viewed these events as positive in resolving uncertainty at the time of the event when viewed as part of the continuing crisis.

Table 4. Regression Analysis.

The results of the regression analysis are presented in the table below. The dependent variable in the regression is SWLTRPCH and is defined as the daily percentage change in SWLTR, the spread of 10-year LIBOR swap rate minus the 10-year Treasury constant maturity rate. The events are defined in Table 1. SWSPRCH is the change in the spread, (ask-bid), for the 10-year LIBOR swap at the end of the trading day. LNTCH is the change in the natural log of the primary dealer transactions by security - U.S. Government Securities Coupon Securities Due in More Than 6 Years but less than or equal to 11 years outright transactions. BLSCH is the change in the net foreign purchases of U.S. Treasury securities. SPRET is the daily return on S&P 500 index. The sample period is from January 3, 2006 to March 20, 2009 (N=803). Panel A shows the values for the R-squared, the F-statistic, and the probability for the F-statistic for the regression. Panel B, column 1 shows the name of the independent variable, column 2 the event date(s), column 3 the coefficient of the independent variable, column 4 the t-statistic of the coefficient, and column 5 shows the probability or p-value associated with the t-statistic for the variable. The t-statistics are adjusted for autocorrelation and heteroskedasticity based on the Newey-West (1987) method.

Panel A

R-squared	0.412293
F-statistic	22.711990
Prob (F-statistic)	0.000000

Panel B

<u>Variable</u>	<u>Event Start Date(s)</u>	<u>Coefficient</u>	<u>t-statistic</u>	<u>Probability</u>
C	N/A	0.499285	1.202146	0.2297
EVENT1	12/12/2007	-24.13398	-32.36844	0.0000
EVENT2	3/11/2008	-8.369216	-8.818212	0.0000
EVENT3TO4	3/16-17/2008	-18.13519	-17.04912	0.0000
EVENT5	8/1/2008	-1.177784	-1.937073	0.0531
EVENT6	9/7/2008	-1.266372	-1.245724	0.2132
EVENT7TO12	9/14-25/08	28.36672	9.779616	0.0000
EVENT13	10/3/2008	-7.087672	-5.090749	0.0000
EVENT14	10/8/2008	-32.92255	-14.11899	0.0000
EVENT15	10/13-14/2008	-6.343039	-1.703164	0.0889
EVENT16	10/31/2008	33.88534	46.88011	0.0000
EVENT17TO19	11/18-21/08	-39.33663	-22.79341	0.0000
EVENT20	11/25/2008	22.35438	19.86721	0.0000
EVENT21	12/17/2008	-43.26225	-21.10295	0.0000
EVENT22	12/30/2008	-21.13071	-23.68439	0.0000
EVENT23	1/12/2009	73.38862	77.41063	0.0000
EVENT24TO25	1/16-19/09	-133.9617	-136.4911	0.0000
EVENT26	1/29/2009	171.8793	104.7566	0.0000
EVENT27	2/20/2009	-11.33684	-7.29796	0.0000
EVENT28	3/3/2009	-8.629275	-13.50491	0.0000
EVENT29	3/18/2009	50.05961	81.75575	0.0000
SWSPRCH	N/A	4855.622	0.148539	0.8820
LNTCH	N/A	-4.082654	-0.727395	0.4672
BLSCH	N/A	7.02E-06	0.635462	0.5253

SPRET	N/A	-0.996305	-2.045617	0.0411
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N/A refers to not applicable.

If we refer back to Table 2 and examine the events that had the largest absolute negative impact on SWLTR, they came from EVENT 1 (the Federal Reserve announced the Term Auction Facility) with an impact of -0.19 percent. This was the first step in developing new monetary policy tools because the Federal Reserve's traditional tools, particularly the discount window, were not working. EVENT14 (six central banks announce rate cuts and Fed agrees to provide more funds for AIG) had a close and second highest impact of -0.18 percent.. The coordination of the six central banks illustrated the recognition that there was a world problem, not just a U.S. problem. In addition, the AIG situation appeared to be worsening and one has to remember all the banking counterparties on the other side of the credit default swaps that AIG wrote. EVENT24TO25 (the Citigroup and Bank of America crises and the release of the remaining \$350 billion in the TARP) had the third highest negative impact with -0.16 percent. EVENT21, EVENT3TO4, and EVENT17TO19 also had negative impacts of greater than -0.10 percent. Two events, EVENT7TO12 and EVENT16, both had positive absolute impacts on SWLTR of 0.13 percent.

Only one of the control variables, SPRET, is statistically significant at the .05 level and it has the hypothesized negative coefficient. As SPRET decreases, the default risk of the swap should increase and the swap rate should increase; therefore, SWLTPCH should increase. As SWSRCH decreases, the swap becomes more liquid and the swap rate should decrease; therefore, SWLTPCH should decrease. The sign for SWSRCH is positive as hypothesized; however, it is not significant. As LNTCH increases, the Treasury security becomes more liquid and the Treasury rate should decrease; therefore, SWLTPCH should increase. The sign is

negative instead of the hypothesized positive but it is not significant. The lack of significance of these two liquidity variables may not be surprising because the Treasury and swap markets would generally be considered very liquid markets. The BLSCH is positive as hypothesized but it is not significant. The monthly back-filling may have affected the usefulness of this variable.

We discuss the importance of our results and their implications in the next section.

V. Summary and Conclusions

This paper analyzes the increasing default risk related of long-term U.S. Treasury securities as major events have caused investors to question the credit worthiness of these securities. We use the spread between the 10-year USD LIBOR swap and the 10-year U.S. Treasury security as a measure of the default risk. The 10-year swap is regarded as the “other benchmark” by the *Wall Street Journal*. As we test the significance of major events on the percentage change in this spread, we control for the liquidity of the two markets, the default risk of the swap, and the net foreign purchases of Treasuries.

The results demonstrate that 13 of the tested 20 events had a negative and statistically significant impact on SWLTR and one event was negative but not significant. Six of the events had an absolute negative impact on SWLTR of -0.12 to -0.19 percent. Six events had a positive impact on SWLTR and two events had an absolute positive impact on SWLTR of 0.13 percent. Controlling for the liquidity risks, the swap default risk, and the net foreign purchases of Treasuries, the lower spread is consistent with a greater default risk for U.S. Treasury securities.

The study adds to the existing evidence in many ways. Consistent with earlier studies (Zivney and Marcus 1989, Nippani, Liu and Schulman 2001, and Liu, Shao and Yeager 2009),

we show that there is enough evidence to suggest that Treasury yields are not viewed by the market as “default risk-free” especially during a financial crisis. The study also supports the use of the spread between the 10-year Treasury rate and the 10-year LIBOR swap rate as a measure of the default risk with the recognition that other factors/variables may affect that spread. Our study is also the first to show that the market charges a default risk premium on long-term Treasury securities in severe economic conditions. This lends support to the contention of Haubrich (2001) that swaps are more likely to be replacement or substitute for Treasuries as a financial benchmark. This is also supported by the announcements of Moody’s credit ratings agency over the past two years that the AAA ratings for U.S. government debt could be reassessed in 10 years, if the situation does not improve. We also provide evidence to support the discussion of Kotlikoff (2006) that the level of debt may be too high and steps need to be taken to control increasing levels of government debt.

As of June 18, 2009, the total public debt outstanding was just under 11.4 trillion dollars.¹⁶ As mentioned in Liu, Shao and Yeager (2009):¹⁷

The U.S. Treasury debt exceeded \$10 trillion on September 30, 2008, so each additional basis point in the risk premium translates into \$1 billion additional interest expense to the Treasury.

There is also some evidence of the increasing debt levels are of public concern and are being often discussed in the popular press. For example, in an article in the *New York Times*, Leonhardt (2009)¹⁸ mentions:

¹⁶ The exact figure was \$11,399,258,796,766.10 as per the website:
[Hhttp://www.treasurydirect.gov/NP/BPDLogin?application=npH](http://www.treasurydirect.gov/NP/BPDLogin?application=npH)

¹⁷ See p. 1465, Liu, Pu, Shao, Yingying and Yeager, Timothy J. (2009) “Did the repeated debt ceiling controversies embed default risk in U.S. Treasury Securities?” *Journal of Banking and Finance*, 33, 1464-1471.

This debt will constrain the country's choices for years and could end up doing serious economic damage if foreign lenders become unwilling to finance it.

And concludes thus:

The solution though, is no mystery. It will involve some combination of tax increases and spending cuts. And it won't be limited to pay-as-you-go rules, tax increases on somebody else, or a crackdown on waste, fraud and abuse. Your taxes will probably go up, and some government programs you favor will become less generous.

This is a legacy of our trillion-dollar deficits. Erasing them will be one of the great political issues of the coming decade.

This is very consistent with the views of Thakor (2006), who talks about renegotiating these extravagant promises and diminishing the nation's contingent liabilities. Our paper adds empirical evidence to these views in that we show that the extra burden that the government is undertaking to combat the current financial crisis is coming at an increased cost to the taxpayers. While prior studies have shown evidence of a default risk premium being embedded in short-term Treasury securities, we have shown that even longer term Treasury debt is now vulnerable to this situation. Our results add to the view expressed by Liu et al (2009) that increased servicing costs could prove to be a terrible burden for the Treasury in the long run. Our evidence that even long-term Treasury debt is susceptible to default risk is an emphatic statement by the market that it now considers Treasury debt of all maturities to be potentially risky.

¹⁸ See David Leonhardt (2009), "America's Sea of Red Ink Was Years in the Making," June 9, *New York Times*. [Hhttp://www.nytimes.com/2009/06/10/business/economy/10leonhardt.html](http://www.nytimes.com/2009/06/10/business/economy/10leonhardt.html)H.

References

- Bonfirm, D. (2009). "Credit risk drivers: Evaluating the contribution of firm level information and of macroeconomic dynamics." *Journal of Banking and Finance* 33, 281-299.
- Cornett, Marcia M. and Hassan Tehranian (1990). "An Examination of the Impact of the Garn-St. Germain Depository Institutions Act of 1982 on Commercial Banks and Savings and Loans." *Journal of Finance* 45 (1), 95-111.
- Dungey, M., Goodhart, C. , Tambakis, D. (2008). "The U.S. treasury market in August 1998: untangling the effects of Hong Kong and Russia with high-frequency data." *International Journal of Finance and Economics* 13 (1), 40-52.
- Ehrhardt, Michael C. and Eugene F. Brigham (2008). *Corporate Finance: A Focused Approach*. 3rd edition. Florence, KY: South-Western Cengage Learning.
- Federal Reserve Board of Governors (2010). "Statistical Release H.15: Selected Interest Rates." <http://www.federalreserve.gov/releases/h15/update/>.
- Fidler, Stephen, and Neil Shah (2009). "Bonds Hit by Ratings Fears." *Wall Street Journal*, May 22. <http://online.wsj.com/article/SB124289673880242719.html>.
- Gokhale, Jagadeesh and Smetters, Kent (2005). "Measuring Social Security's Financial Problems." National Bureau of Economic Research Working Paper No. 11060, January .
- Guerrera, F., Van Duyn, A., and Pimlott, D. (2008). "U.S. risks losing triple-A rating." *Financial Times*, January 11. http://www.ft.com/cms/s/0/6abff5da-bff8-11dc-8052-0000779fd2ac.html?nclink_check=1.
- Haubrich, Joseph G. (2001). "Swaps and the Swaps Yield Curve," Economic Commentary, Federal Reserve Bank of Cleveland, December. <http://www.clevelandfed.org/research/commentary/2001/1201.pdf>.
- Kotlikoff, Laurence J. (2006). "Is the United States Bankrupt?" Federal Reserve Bank of St. Louis *Review*, 88 (4), 235-249. <http://research.stlouisfed.org/publications/review/06/07/Kotlikoff.pdf>.
- Liu, Pu, Shao, Yingying and Yeager, Timothy J. (2009). "Did the repeated debt ceiling controversies embed default risk in U.S. Treasury Securities?" *Journal of Banking and Finance*, 33, 1464-1471.
- Leonhardt, David (2009). "America's Sea of Red Ink Was Years in the Making." *New York Times*, June 9. <http://www.nytimes.com/2009/06/10/business/economy/10leonhardt.html>.

Mandaro, Laura (2009). "U.S. sovereign-credit spreads rise sevenfold in year." MarketWatch.com, March 10. <http://www.marketwatch.com/story/cost-buy-protection-against-us-government>.

McDonald, Robert (2008). "Finance and the Public Interest: Credit Default Swap Update," November 13, 2008 response. Kellogg School of Management, Northwestern University, Evanston, Illinois, available at <http://kelloggfinance.wordpress.com/2008/09/18/credit-default-swap-update/>.

Newey, W., and West, K. (1987). "A Simple Positive Semi-Definite Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica* 55, 707-708.

Nippani, S., Liu, P., & Schulman, C. T. (2001). "Are treasury securities free of default?" *Journal of Financial and Quantitative Analysis* 36, 251–266.

Reuters (2009). "Reducing Deficit Key to U.S. Rating: Moody's." October 22. <http://www.reuters.com/article/idUSTRE59L1N620091022>.

Shanahan, Michael, and Moses, Abigail (2008). "Treasury credit swaps soar to record on new \$800 billion pledge." Bloomberg.com. November 26.

Thakor, Anjan (2006). "Commentary: Is the United States Bankrupt?" Federal Reserve Bank of St. Louis *Review*, 88 (4), 251-257. <http://research.stlouisfed.org/publications/review/06/07/Thakor.pdf>.

Zivney, Terry L. and Marcus, Richard D. (1989). "The Day the United States Defaulted On Treasury Bills." *Financial Review*, 24 (3), 475-489.