International Review of Financial Analysis 19 (2010) 118–126

Contents lists available at ScienceDirect

International Review of Financial Analysis

Impact of credit spreads, monetary policy and convergence trading on swap spreads

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ARTICLE INFO

Article history:
Received 14 November 2009
Received in revised form 30 November 2009
Accepted 12 January 2010
Available online 18 January 2010

JEL classification:
G15
G12

Keywords:
Swap spread
Credit spread
Convergence trading

ABSTRACT

We investigate the determinants of US swap spreads based on the development of the swap market and the major events that happened between 1991 and 2006. We find that changes in swap spreads are jointly determined by the liquidity premium, interest rate level, default risk premium and the business cycle. The changes in swap spreads are positively related to liquidity premium, interest rate level and the slope of risk-free term structure. Amongst the various credit spreads, Finance AA spreads and agency spreads have the most influence on swap spreads. We also find that swap spreads changed from pro-cyclical to counter-cyclical after 1999. When the market features heavy speculative trading, such as the convergence trading activities of swap spreads, the magnitude of swap spreads is affected and their behaviour becomes uncertain.

1. Introduction

The interest rate swap market is the largest over-the-counter (OTC) interest rate derivatives market with an average daily turnover of US $1.2 trillion and outstanding amount of $332 trillion. An interest rate swap (IRS) is a contractual agreement between two parties to make periodic payments to one another based on two specific interest rates: the fixed rate and the floating rate. The fixed rate is known as the "swap rate" and the floating rate is usually an interbank deposit rate, such as the London Interbank Offered Rate (LIBOR). Swap spread is the difference between the swap rate and the yield on the most recently issued Treasury security with the same maturity. Swap spread represents the difference between the financing costs of top-quality financial institutions and the government. Given the wide application of interest rate swap, swap spreads are closely monitored by market participants, central banks and regulators.

The objective of this paper is to examine how the development of the swap market and major events from 1991 to 2006 affected the determination of swap spreads. This study contributes to the literature in three distinct ways. First, we divide the sample period into three sub-periods to highlight the effects of major development in the swap markets. Second, we apply various credit spreads to proxy for the default risk premium to test which credit spread has the most influence on swap spreads. Third, instead of using the Treasury bill or bond yields as proxies for the interest rate level, we use changes in Eurodollar deposit rates to represent the change in interest rate level. This enables us to eliminate the disturbance of the liquidity premium possessed by the Treasury securities and to examine the effect of monetary policy on swap spread, as the Eurodollar deposit rates are very responsive to changes in the Fed Fund target rate.

The remainder of the paper is organised as follows. Section 2 provides a brief overview of the relevant literature. Section 3 outlines the hypothesis development. Section 4 provides the data definitions and descriptive statistics. Section 5 presents the empirical model and findings, and conclusions are given in Section 6.

2. Literature review

The most widely studied determinants of swap spreads are the liquidity premium, the default risk premium, interest rate level, slope of risk-free term structure, interest rate volatility and business cycle. Grinblatt (2001) was the first to propose that swap spreads are compensation for the higher liquidity associated with holding government securities as compared to entering into a swap contract to receive fixed payments. Using different proxies for the liquidity premium, Duffie and Singleton (1997), He (2000), Fehle (2003), Liu, Longstaff, and Mandell (2006) find that variations in swap spread are mainly caused by changes in the liquidity premium. Lekkos and Milas (2001) and In, Brown, and Fang (2003) use the TED spread as the proxy for the liquidity premium and find that it has a significant impact on the variation of US swap spreads, particularly on the shorter maturities.

The default risk premium is another major determinant of swap spread. Researchers have used various credit spreads to represent

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1057-5219/$ – see front matter
doi:10.1016/j.irfa.2010.01.004

the default risk premium, the most common being the yield spread of AA-rated corporate bonds in the industrial sector. However, the results may vary depending on the proxy used. Brown, Harlow, and Smith (1994) use credit spreads of different ratings to regress against swap spreads and find that the stronger credits, such as triple-A and single-A bond spreads, give rise to a higher adjusted R^2. Duffie and Singleton (1997) use the spread between rates of Baa- and Aaa-rated commercial paper as a proxy for the default risk premium and find that they have a positive effect on swap spreads. Minton (1997) uses the yield difference between Baa- and Aaa-corporate bonds, the "Corporate Quality Spread" (CQSP), and the yield difference between Baa- and treasury securities, the "Aggregate Default Spread" (ADSP), as proxies for the default risk premium and finds that the ADSP has a better explanatory power for changes in swap rates. Lang, Litzenberger, and Liu (1998) use both single-A spread and agency spread to regress against swap spread and find that both spreads have a significant effect on swap spreads.

Most recent studies have used data from Bloomberg's Fair Market Curve Indices (FMCI) to calculate the default risk premium. Lekkos and Milas (2001) use the difference between the yields of a portfolio of triple-A-rated corporate bonds and those of Treasury securities to find that the effects of the default risk premium are more important for swaps of longer maturities. Fehle (2003) uses the triple-A bond spread and single-A bond spread and finds that the swap spread is affected by the bond spreads in various currencies. Kobor, Shi, and Zelenko (2005) use the double-A bond spread to act as an indicator of an expected systemic deterioration of the banking sector and find that an increase in the double-A bond spread of 10 basis points lead to an increase of 5.6 basis points in the 10-year swap spread. Feldhütter and Lando (2008) also find that the information in the corporate bond market is a better proxy to capture the default risk element in swap rates.

As swap spreads are a form of credit spread, we expect the factors influencing credit spreads will have a similar effect on swap spreads. One factor is the change in the interest rate level. Longstaff and Schwartz (1995) point out that a higher interest rate will increase the risk-neutral drift of the firm value process and that the higher drift will reduce the probability of default and cause a narrowing of credit spreads. They also find evidence that credit spreads are negatively related to the interest rate level and the return on assets. Duffee (1998), Collin-Dufresne, Goldstein, and Martin (2001) produce similar results. However, the ultimate relationship between the interest rate level and credit spread is still unclear. Neal, Roll, and Morris (2000) document a short-term negative relationship that changes back to a positive relationship in the long run. Bevan and Garzarelli (2000) find that the relationship between credit spreads and Treasury rates actually depends on the time horizon and is ultimately positive over an extended period. The impact of the change in the interest rate level on swap spreads has also been studied extensively. Duffie and Singleton (1997) use the 6-month Treasury bill yield as the proxy for the interest rate level and find that it explains some of the variation in 10-year swap spreads. A number of studies carried out between 2000 and 2006 have produced mixed results. Lekkos and Milas (2001) use the 3-month Treasury bill yield and find that the interest rate level has a negative impact on US swap spreads. In et al. (2003) also use the 3-month Treasury bill yield in an EGARCH model and produce the same result.

Another factor that affects swap spreads is the slope of risk-free term structure. However, we can interpret the slope of the yield curve from two different perspectives: it can serve as the proxy for implied forward rates or as an indicator of the business cycle. Friedman and Kuttner (1993) suggest that as the slope of the risk-free term structure is pro-cyclical and the credit spreads counter-cyclical, swap spreads should be negatively related to the slope of the risk-free term structure. However, the picture has changed recently. Over the past decade, central banks in Asia and Europe have increased their holdings of US Treasury securities. In August 2009, China held $797 billion in US Treasury securities compared with $52 billion in 1999. Japan also increased its holdings from $320 billion in 1999 to $731 billion by 2009. In addition, pension funds across the United States and Europe have increased their holdings of long-dated Treasury securities to match the duration of their long-term liabilities. The steady demand for US Treasury securities has kept the long-term interest rates more stable relative to the short-term interest rates. Therefore, as the short-term interest rate increases when the Federal Reserve tightens monetary policy, the yield curve tends to flatten rather than steepen. On the other hand, we can also interpret the slope of the yield curve as the market consensus for the implied forward rates. In this sense, a steepening of the yield curve means that the implied forward rates have gone up, whereas a flattening of the yield curve is equivalent to a decline in the implied forward rate. The empirical findings generally indicate that the slope of the risk-free term structure has a negative impact on swap spreads, thus supporting the notion that the slope of risk-free term structure is best interpreted as an indicator of the business cycle. However, most of the studies were carried out before 2000, when there was less demand for long-dated US Treasury securities. The various studies have produced mixed results. Minton (1997) uses the difference between the yields of the 30-year Treasury bond and the 3-month Treasury bill and found that swap rates were positively related to the slope of the risk-free term structure. Lekkos and Milas (2001) use the difference between the 10-year and 2-year Treasury bond yields as the slope of the risk-free term structure and find that it is a significant determinant of swap spreads. Fehle (2003), In et al. (2003) and Kobor et al. (2005) apply different measures to represent the slope of the risk-free term structure and find a negative relationship between the slope of the term structure and the swap spreads. Lekkos and Milas (2004) find that the slope of the term structure is the determinant of a regime switching model for swap spreads. In a later study, Lekkos, Milas, and Panagiotidis (2007) find more evidence that the non-linear model has better predicting power.

The contingent-claims approach suggests that the debt claim is similar to a short position in a put option. As interest rate volatility increases, the option value also increases and the credit spread should widen. In other words, increased volatility increases the probability of default. Sorensen and Bollier (1994) claim that the shape and estimated volatility of the yield curve determines the option value that is embedded in the replacement cost of the swap. In general, the relation between interest rate volatility and swap spreads ranges from significantly positive to statistically insignificant. Minton (1997) finds that swap rates are positively related to short-term interest rate volatility, which is consistent with the theory proposed by Sorensen and Bollier (1994). In et al. (2003) find that interest rate volatility is positively related to swap spreads. However, Lekkos and Milas (2001) find no significant relationship between swap spreads and interest rate volatility.

The negative relation between credit spreads and equity return is well documented. Longstaff and Schwartz (1995) find a negative relation when they used the equity return of different sectors to regress against their own credit spreads. Alessandrini (1999) also finds a negative relationship when the returns of the Dow Jones Industrial Average (DJIA) are regressed against various credit spreads. Collin-Dufresne et al. (2001) employ the returns on the Standard & Poor's (S&P) 500 Index and find a negative relationship between credit spreads and equity return. As equity return is a leading indicator of the business cycle, credit spread is accordingly counter-cyclical in nature. In addition to using equity return, researchers have applied alternative measures to proxy for the business cycle. Minton (1997) uses industrial production growth as a proxy for the business cycle, though her results do not reveal any significant effect on the swap rate. Lang et al. (1998) use detrended unemployment and the percentage change of unemployment to proxy for the