Credit risk of swaps

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A swap is a financial contract between two parties, where each party pays the other party periodic payments over the life of the contract according to some pre-specified rules based on certain underlying index. In most swaps, one party makes the fixed payments while the other party delivers the floating payments according to the underlying index. The two most common types are the interest rate swaps and currency swaps, where the underlying index is the interest rate and exchange rate, respectively. The payments are calculated based on notional principal, and usually the payments between the parties are netted. For interest rate swaps, there is no exchange of principals at initiation or maturity. However, for currency swaps, principals at the respective currencies are exchanged at both initiation and maturity. At initiation of the swap, the value of the swap is set to be zero to both parties. The fixed rate of the swap is then calculated such that the present value of the fixed payments equals that of the floating payments based on the current information of the underlying index. As time evolves, the underlying index may move upward or downward so that the value of the floating payments changes. Therefore, the value of the swap changes in later times, and its value at each time is given by the difference in the present values of the remaining cash flows from the two parties. For example, consider an interest rate swap and an upward interest move environment, the floating rate payer is expected to pay more in future payments so that swap is expected to be in-the-money to the fixed rate payer.

In swap contracts, there are two most basic forms of risk: price risk and default risk. The price risk arises due to the movement of the underlying index so that the default free present value of the future payments changes. The price risk can be hedged by taking offsetting positions using related derivative instruments, like interest rate futures, currency futures, etc. The default risk is defined to be the exposure to the risk of failure of the other counterparty. Unlike forward contracts, swaps are over-the-counter contracts so they are not backed by the guarantee of a clearing house or an exchange. Swap default may be due to early termination of the swaps contract, or defaulting on some other obligation or filing for bankruptcy. Early termination may be due to the non-performance of obligations under the swap contract, for example, defaulting on a swap payment. The swap may include clauses that trigger early termination, say, the credit rating of either party falling below a certain class, or failure to meet margin payment when required on a marking to market basis.

Assessment of termination damages in case of premature termination is based on the replacement cost of the swap. An estimate of the swap value is obtained from quotes from several established swap dealers. The average of these quotes is used as the replacement value. The cost of default is related to the replacement cost of the contract, and this depends on the rule for sharing claims in default. There are two basic rules of settlement. In the full two-way settlement, if the swap has positive value to the defaulting

party, the counterparty pays the full replacement value of the swap. However, in the limited two-way settlement, the non-defaulting party is not liable to pay the defaulting party even the swap is in-the-money to the defaulting party based on the rationale that there has been a breach of contract by the defaulting party. In real life, non-defaulting parties have typically settled out of court by paying part of the replacement cost to the defaulting parties.

The common tools of default risk analysis of swaps use either the structural models or the reduced form models. The structural models **(**Baz and Pascutti, 1996; Cooper and Mello, 1991; Li, 1998) employ the contingent claim approach where the firm values of the swap parties are assumed to follow some stochastic processes. Default occurs when either firm value cannot meet its liabilities. The payment streams are incorporated as source terms in the governing partial differential equation and the settlement rules are modeled as auxiliary conditions. In the reduced from models (Duffie and Huang, 1996; Huge and Lando, 1999), default arrives suddenly as point process. Valuation of defaultable securities is characterized by an effective discount rate, which is above the default free rate by a premium that is related to the arrival rate of default and recovery rate upon default.

All theoretical analyzes on credit risk of swaps show that the difference in swap rates between two counterparties of different credit ratings is much less than the difference in their debt rates. For example, Duffie and Huang (1996) found that for a 5-year interest rate swap between a given party paying LIBOR and another party paying a fixed rate, the replacement of the given fixed-rate counterparty with a lower quality counterparty whose bond yields are 100 basis points higher, increases the swap rate by roughly 1 basis point. For a 5-year currency swap, with volatility on the exchange rate of 15%, their model shows the impact of credit risk asymmetry on the market swap rate to be roughly 10-fold greater than that for interest rate swaps. This is consistent with the actual market practices that swap dealers quote the same rates to all counterparties, irrespective of their credit ratings. The insensitivity of swap rates to credit ratings may be attributed to the very nature of a swap that it can be either an asset or liability to either counterparty. Also, the multi-period nature effectively mitigates the impact of default risk. In real market environment, several non-price devices to control default risk are commonly used in swap markets to limit the ability of bad firms to shift risk via swaps. Some of these common techniques include credit trigger, collateral, netting and marking-to-market.

References

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