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RISK AND RETURN IN CONVERTIBLE ARBITRAGE: EVIDENCE FROM THE CONVERTIBLE BOND MARKET

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RISK AND RETURN IN CONVERTIBLE ARBITRAGE

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Introduction

• Convertible Bond (CB) can be converted into a fixed number of shares of the issuing company ⇒ CBs allow to benefit from
  – capital appreciation potential of equity shares
  – higher income and safety of fixed income instruments

• Between 2000 and 2002 the amount of new issues of CBs was close to $ 300 billion, which is comparable with new equity issues
  – Mind stringent market conditions ⇒ CB market appeared to be an important source of capital for corporations when equity issues limited

• No publicly traded market for CBs
  – Convertible Arbitrage hedge funds are the major providers of liquidity for primary and secondary markets of CBs
  – Most transactions are performed in over-the-counter market ⇒ lack of observability; difficult to reliably track trading strategies
Questions addressed

- What are the risk-return characteristics of CA hedge funds when these are treated as liquidity providers to CB market?
  
  ⇒ possible supply-demand imbalances cause severe adverse effects for CA, hence, justifying their 'abnormal' returns

- What role do investment opportunities in the CB market play in determining Convertible Arbitrageurs’ profitability?
  
  ⇒ CA-related ABS factors (cf. Fung and Hsieh, 2001) explain a large proportion in the variance of CA returns

- How do extreme market conditions affect the style of managing inventories? (e.g. LTCM episode)
  
  ⇒ extraordinary market events change CA hedge funds’ exposure to their strategies
Models of Convertible Arbitrage
Fung and Hsieh (1997) introduced a model where a portfolio of hedge funds can be represented as a linear combination of basic, synthetic hedge fund strategies

- Ideally, these synthetic strategies are rule-based constructs involving only observable asset prices

- Referred to as Asset-Based Style factors (ABS)

In this paper three main sources of risks for CB market are considered as ABS factors:

1. Equity volatility
2. Credit (default) risk
3. Interest rate risk
Features of Convertible Arbitrageurs

- **Strategy**: buying a portfolio of CBs and hedging the corresponding equity risk by selling short the underlying stocks (quantities depend on the parameters of CBs and market conditions)

- **Aim**: Exploit Convertible Arbitrageurs’ perceived comparative advantage in their ability to manage risks inherent in CBs

- **Role**: Active CA strategies provide short-term liquidity to otherwise illiquid and incomplete CBs markets

The paper focuses on the following basic trading strategies in CA:

1. Volatility arbitrage, VOLARB
2. Credit arbitrage, CREDITARB
3. Positive carry, CARRY
Volatility arbitrage strategy, VOLARB

VOLRAB strategy manages equity risk, while hedging credit risk and interest rate risk. For this, arbitrageur selects bonds with high $\gamma$

- Use the result that sensitivity w.r.t. underlying is high when bond’s equity option is at-the-money

- Select CBs with parities between 90% and 110% of the par values, using Merton (1973):

$$Parity = \left( \frac{conversion \ ratio \times S_{t-1} \times \exp(-d \times \tau)}{par \ value} \right) \times 100\%$$

For each of the selected bonds in this portfolio, compute daily return $R_{CB,t}^{GAMMA}$, and to account for the equity risk embedded into portfolio, calculate daily return of the underlying associated with each CB, $EQ_t^{GAMMA}$

VOLARB hedges credit risk $CR_t$ and interest rate risk $IR_t$

We estimate the risk exposures $R_{CB,t}^{GAMMA} = \gamma_0 + \gamma_1 EQ_t^{GAMMA} + \gamma_2 IR_t + \gamma_3 CR_t + \eta_t$
Volatility arbitrage strategy
Return to VOLARB follows that of a portfolio which is

- long in high-gamma CBs
- short in the corresponding stocks ⇒ underlying value risk
- short in government bonds ⇒ interest risk
- short in the spread between corporate and gov’t bonds ⇒ credit risk

Include market frictions:

- long position in CBs is financed at a borrowing rate, $DISC_t$,
- interest due on short positions (in $EQ_t^{GAMMA}, IR_t, CR_t$), called short rebate, is lower then $DISC_t$ by a spread $s$

The cost-adjusted returns from VOLARB is given by

$$VOLARB = (R_{CB,t}^{GAMMA} - DISC_t) - \hat{\gamma}_1 XEQ_t^{GAMMA} - \hat{\gamma}_2 XIR_t - \hat{\gamma}_3 XCR_t$$
Credit arbitrage strategy, CREDITARB

CREDITARB captures value from possible inadequate prising of credit risk embedded in CBs.

The credit risk content of CBs rises as the bond goes out-of-the-money

⇒ Pick a set of bonds with parity below 20%

CREDITARB mitigates equity risk and interest rate risk

⇒ Adopt measures of corresponding stocks changes, \( XEQ_t^{CREDIT} \), and interest risk hedge, \( XIR_t \)

- Estimate the hedge ratios:

\[
R_{CB,t}^{CREDIT} = \delta_0 + \delta_1 XEQ_t^{CREDIT} + \delta_2 IR_t + \xi_t
\]

Given the estimates of \( \delta_0 \) and \( \delta_1 \), the cost-adjusted daily return of the CREDITARB portfolio is given as:

\[
CREDITARB_t = (R_{CB,t}^{CREDIT} - DISC_t) - \hat{\delta}_1 XEQ_t^{CREDIT} - \hat{\delta}_2 XIR_t
\]

This CREDITARB portfolio includes a long position in deep out-of-the-money CBs, a short position in the underlying stocks, and a short position in government bonds
Positive carry strategy, CARRY

CARRY selects CBs that satisfy positive net cash flow condition:

\[ \text{NetCashflow}_t = (B_t \times c_y_t) + (\text{delta}_t \times B_t \times (\text{DISC}_t - s - d_y_t)) - (B_t \times \text{DISC}_t) \]

As before, compute the returns on the portfolio of selected bonds, \( R_{CB,t}^{\text{CARRY}} \), and of the corresponding securities, \( EQ_t^{\text{CARRY}} \). Next,

\[ R_{CB,t}^{\text{CARRY}} = \phi_0 + \phi_1 EQ_t^{\text{CARRY}} + \varpi \]

estimate the hedge ratio.

The cost-adjusted return on the CARRY portfolio is

\[ CARRY_t = (R_{CB,t}^{\text{CARRY}} - \text{DISC}_t) - \hat{\phi}_1 X EQ_t^{\text{CARRY}} \]
Empirical Methodology

Two groups of CB investors:

- long-term holders $\leftarrow$ proxy by CA mutual funds
- short-term holders $\leftarrow$ proxy by CA hedge funds, who act like market-makers in the CB market

CA hedge funds hold net-long inventory of CBs
$\Rightarrow$ attribute shares of their returns to passive component and to actively managed component

- Capture passive component return by regressing CA hedge fund returns on CA mutual fund returns
  $\leftarrow$ employed $VG_t$ Vanguard Convertible Securities mutual fund to proxy the latter

- $CA_t = \lambda_0 + \lambda_1 VG_t + \pi_t$
  where $\pi_t$ is residual of CA hedge funds excess-return left unexplained by the passive component
Estimation

The results in Table IV Panel A suggest that passive holding of inventory in CBs does not entirely explain the variation in CA returns

- Next, add CA ABS factors:

\[ C A_t = \theta_0 + \vartheta V G_t + \theta_1 V O L A R B_{tUS} + \theta_2 C R E D I T A R B_{tUS} + \theta_3 C A R R Y_{tUS} + \theta_4 V O L A R B_{tJP} + \theta_5 C R E D I T A R B_{tJP} + \theta_6 C A R R Y_{tJP} + \theta_7 F X R E T_t + \psi_t \]

This regression applied to

- CISDM, CSFB Tremont, Hedge Fund Research indices
- Equally-Weighted portfolio of 155 CA funds, Small and Big sub-portfolios

resulted in dramatically improved \( R_2 \) and significant estimates for ABS factors
**Extreme events incidence**

The authors estimated structural break in the model accounting for LTCM crisis:

\[ CA_t = \xi + \omega_1 VG_t + \omega_2 VOLARB_t^{US} + \omega_3 CREDITARB_t^{US} + \omega_4 CARRY_t^{US} + \omega_5 VOLARB_t^{JP} + \omega_6 CREDITARB_t^{JP} + \omega_7 CARRY_t^{JP} + \omega_8 FXRET_t + \kappa_t \]

Where pre-LTCM collapse dummy D (equals unity before Oct 1998, and zero otherwise) enters into

- intercept \[ \xi = \xi_0 + \xi_1 D \]

- slope coefficients \[ \omega_i = \omega_{i0} + \omega_{i1} D \]

\( H_0 \) corresponding to all incremental coefficients zero is rejected by the F-test \( \Rightarrow \) supports structural break hypothesis relating to LTCM grounding

Analogous test for March 2000 gave insignificant shift estimates \( \Rightarrow \) the Internet bubble break was primarily an equity market event

CA changed their risk exposures in response to LTCM crisis
Supply-demand shocks

Net supply of CBs \equiv \text{market capitalization of all outstanding CBs} \lessdot \text{AUM of all long-term holders of CBs}

Net demand for CBs aggregated AUM of all 155 sample CA hedge funds

SUPDEM represents the investment opportunities available at the CB market

Table VI
\[ CA_t = \alpha + \beta_1 V G_t + \beta_2 V O L A R B_{tUS} + \beta_3 C R E D I T A R B_{tUS} + \beta_4 C A R R Y_{tUS} + \beta_5 V O L A R B_{tJP} + \beta_6 C R E D I T A R B_{tJP} + \beta_7 C A R R Y_{tJP} + \beta_8 F X R E T_t + \beta_9 S U P D E M_t + \chi_t \]

- Result: supply-demand shocks drive the returns downwards
  \Rightarrow \text{non-ABS factor related returns are accounted for as liquidity premia}
Research prospects

Potential towards improvements:

- Even after inclusion of all ABS factors, structural break dummy, and liquidity variable, the model at best explains 50-60% of the variation
- ⇒ Non-linear returns?
- ⇒ Further explanatory variables?

Challenging Research Topics:

- Managerial compensation in Hedge fund industry
- ⇒ Risk shifting vs. prospects of leaving job market
- Model of dynamic restructuring: fund value hitting psychological thresholds leads to new massive investments / capital run
- ⇒ Manager’s choice of risk level optimizing this trade-off