

John Crosby

Grizzly Bear Capital and

Glasgow University Adam Smith Business School

M.Sc. and Ph.D. courses in Finance / Financial  
Economics at Glasgow University Adam Smith  
Business School.

**Convertible bond arbitrage**

- We discuss so-called Convertible Bond Arbitrage strategies.

- We will use the word “arbitrage” as this is the most common terminology used by traders and hedge funds but bear in mind these are NOT arbitrages in the definition of a financial economist. They are **relative value trades** which carry some risk and can and do lose money.

- Convertible bonds (CBs) can be rearranged into equivalent financial instruments (bond + option). The goal of the hedge fund:
- A: Value these instruments (bond + option).
- B: Identify CBs with substantial market price difference compared to theoretical (part A – bond + option) price.
- C: Carry out trades to extract the difference while trying to protect against market risks.

- The arbitrage could involve either buying or selling the CB. Conventional wisdom is that it is more likely to involve buying the CB since the conventional wisdom is that CBs tend to be undervalued relative to theoretical value:
- Several possible reasons:

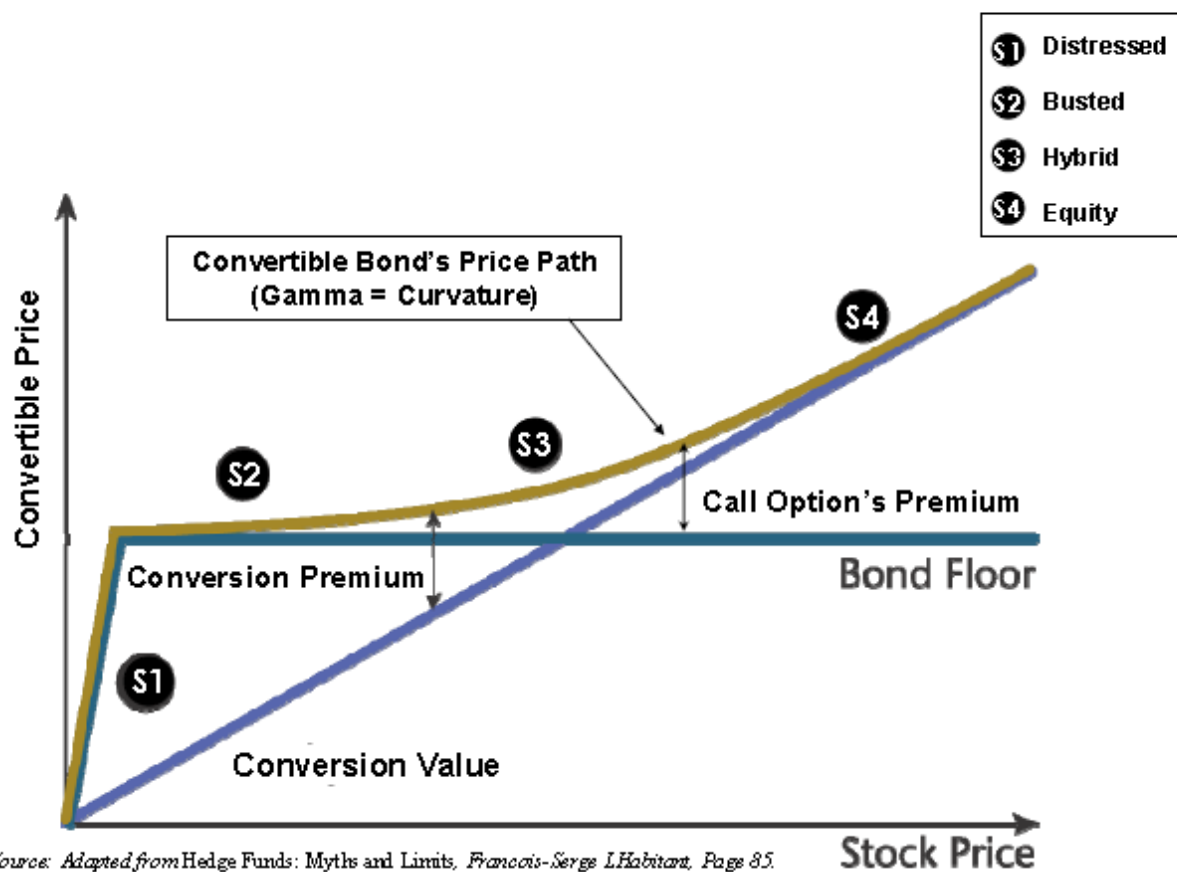
- Most CB issuers low credit quality. Many investors (eg pension funds) not interested => thin liquidity / high bid-offer spreads => even less interest.
- Many CB issues are small size => thin liquidity / high bid-offer spreads => even less interest.
- Investors can already invest in government bonds, corporate bonds and equities which are simpler. Many investors lack the technological and quantitative infrastructure to trade or invest in complex securities such as CBs.

- **Attractive convertible pricing at issue.** Typically, convertible securities are initially priced several percentage points cheap to their theoretical value in order to insure a successful launch. The conversion option is undervalued.

- **Inefficient company timing in calling convertible issues** . If a deep-in-the-money convertible enjoys a significant yield advantage over the common stock but it is not called, it is likely to outperform the underlying stock. Companies may delay conversion for a number of reasons including balance sheet and rating agency considerations as well as “signalling”.



**Figure 1: Four Stages (S1-S4) of a Convertible Bond**



- There are at least 7 different types of arbitrage.
- 1. Cash-flow. 2. Carry 3. Volatility. 4. Gamma. 5. Credit. 6. Refinancing / restructuring. 7. Multi-strategy.
- We look at each in turn (some are related).

# 1. Cash-flow

- Buy CB at 110. Parity (Conversion Ratio X stock price) is 100 say. Sell stock at 100. Hedge fund receives  $110 - 100 = 10$ . Coupon is 5%, stock borrowing costs 2%, stock dividend yield 2%. Get approx  $5 - 2 - 2 = 1$  on 10 dollar capital. Return = 10%.

## 2. Carry

- Similar to cash-flow but no sale of stock. Buy a CB with a higher coupon than the interest-rate on the money you borrowed to buy them.
- No hedges so very risky.
- Relies on a stable to bullish environment with credit spreads flat to narrowing, interest-rates flat or falling and stock prices flat or rising.
- Just like being long a bond + stock – but the CB may be cheaper in the market.

# 3. Volatility

- Delta is the first derivative of the CB price with respect to the stock price.
- Most CB arbitrages go long a CB and short delta shares.
- As the stock price (and other variables (IR, credit spread)) move, delta changes. Hence the delta hedge must be adjusted.

# 3. Volatility continued

- If the stock price rises, delta increases and the hedge fund sells more stock.
- If the stock price falls, delta decreases and the hedge fund buy some stock as he needs a smaller short position.
- So the hedge fund buys stock as it goes down in price and sells it as it rises in price.

# 3. Volatility continued

- The delta-hedge position is long volatility (long or positive vega). If volatility falls and all else stays the same, the position will tend to lose money from the vega.

### 3. Volatility continued

- On the other hand, if there is a big crisis or crash in the market, volatility invariably rises. This helps the P+L from the vega point of view. However, during market crashes, credit spreads tend to rise. This causes losses on the long CB position.
- Further, theoretical models are more likely to be mis-specified (leading to incorrect valuations and/or deltas, etc) leading to divergence between the market and model predictions.



## 4. Gamma

- In addition to delta trading, hedge funds can try to capture additional profits by gamma trading (trading the underlying stock as delta changes.
- Gamma = derivative of delta w.r.t. to stock price.
- Lets assume the hedge fund has bought for \$100 a CB convertible into 100 shares. Suppose the delta is 50%. The hedge fund sells 50 shares at a price of \$0.80 say. Receives \$40. Net cost of position is \$60. Lets call this the original position.

## 4. Gamma continued

- Suppose the share goes up to \$1 dollar and this increases the delta to 70%. The hedge fund sells 20 more shares at \$1.
- Suppose the share price later returns to \$0.8.
- The hedge fund buys 20 shares at \$0.80. The hedge fund is back to the original position.
- But it has made a profit of  $\$0.20 \times 20 = \$4$ .
- That's a percentage profit of  $4/60 = 6.67\%$ .

## 4. Gamma continued

- Note the overall effect of gamma hedging is to reduce the overall volatility of the stock as it always acts against the direction of movement of the share price.
- Again, there is no arbitrage here. The hedge fund can lose as well as gain. Shares of companies which have issued CBs are typically fairly illiquid: High bid-ask spreads. The issue sizes are small so can only trade small volume easily. Small number of market-makers.

## 4. Gamma continued

- Gamma trading is expensive when shares are illiquid and the bigger the gamma, the more expensive it is (higher transactions costs).
- Gamma trading depends on a model which will always be imperfect – and tends to even more imperfect in stressed, high volatility markets.

# 5. Credit

- If the credit of the issuer of the CB falls significantly, the four previous strategies will all lose money (for example (3. Delta), the option becomes worthless, delta goes to zero and you are left with a long position in a CB whose price is falling).
- Worse still, in a credit-crunch (systematic credit risk), the same thing happens to every single CB position simultaneously.
- This can create opportunities for “vulture” funds.

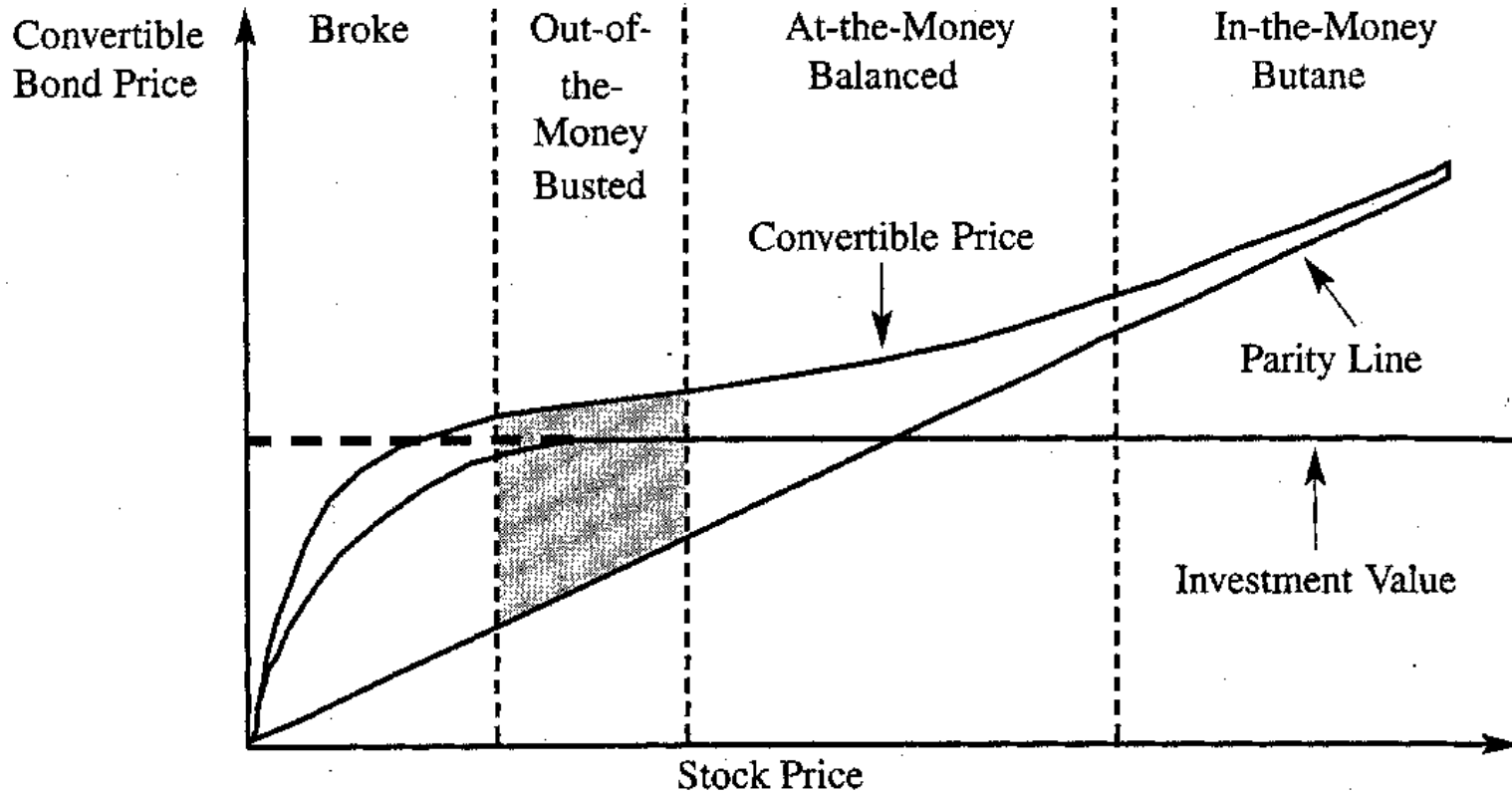
# 5. Credit continued

- Few investors seem to want to be long “Busted convertibles” (ie CBs where the underlying stock has fallen significantly, the option is worthless and the CB is effectively a straight bond on a very poor credit) – especially at a time when there will be many distressed sellers.
- 1./ Vulture funds can buy in the hope that the credit improves.
- Or 2./ They can buy the CB and hedge with a credit default swap.

## 5. Credit continued

- Either way, they benefit if they are able to buy CBs cheaply from distressed sellers. In case 1./, they gain even more if they can do this for many CBs at a time when the systemic risk is falling (eg as an economy recovers from a credit-crunch and there is a significant positive credit-risk premium).
- The fund **MUST** understand the capital structure of the company and the priority of the CB (convertible preferred, junior, senior, etc).

# 5. Credit: Busted convertibles



Secondary Market Behavior: Busted Convertibles



# 5. Credit continued

- A major risk with busted convertibles is illiquidity i.e. high bid-offer spreads.
- But benefits from owning:
- In contrast to junk bonds, the **upside potential is not capped** – may enjoy unlimited upside potential if the stock price recovers.
- With busted convertibles, the equity option (deep out-of-the-money) may be (and often is) **mispriced**. Investors may be effectively buying high yield debt with a “free” equity “kicker”.

## 6. Refinancing / restructuring

- Suppose there is a busted convertible with high credit spread. Few buyers because investors fear that the distressed company cannot meet its obligations. A hedge fund buys in anticipation of a corporate refinancing / restructuring which significantly improves the company's financial position. In this situation, the holder of the CB may do better than either the holder of a straight bond or the holder of the company's equity.

# 7. Multi-strategy

- Any combination of 1 to 6 – perhaps with some sort of portfolio optimization to determine which strategy offers the best risk-adjusted rewards.

- A market-neutral strategy might be defined as one where the P+L (after hedging) is uncorrelated with some measure of the market (eg the S&P 500).
- But any attempt to construct the market-neutral strategy relies on a statistical model of price movements which will inevitably be misspecified (i.e. wrong). Hence, there is always model uncertainty (worse in a crisis, correlations particularly hard to estimate).

- Let us ignore model uncertainty (like most people) and assume we have a model we are happy with.
- How have these Convertible Bond Arbitrage strategies performed?

**Table 3: Convertible Arbitrage Performance Comparison Jan-1990 to Dec-2005 (U.S. Dollars)<sup>7</sup>**

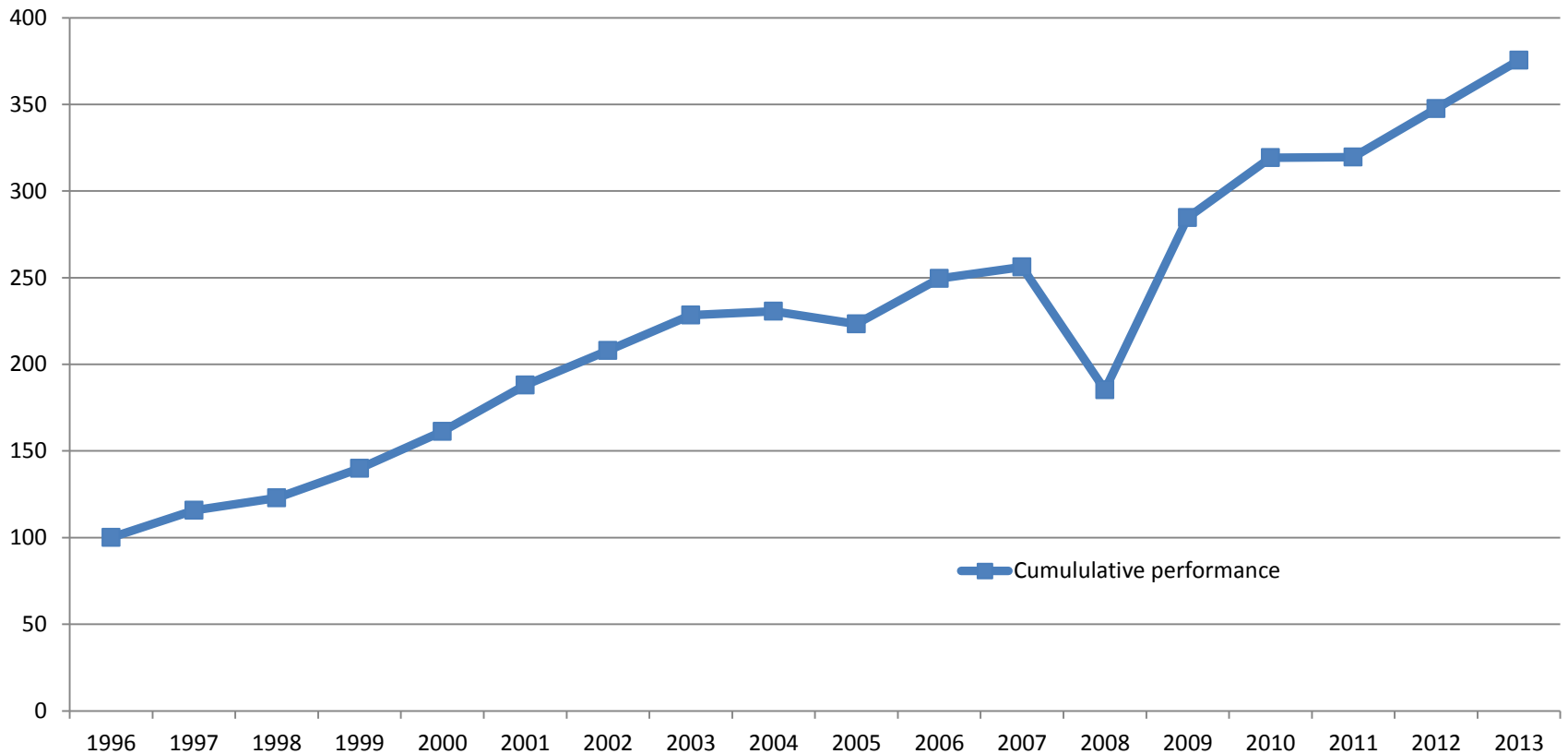
<b>Index</b>	<b>Annualized Compound Return</b>	<b>Annualized Standard Deviation</b>	<b>Maximum Drawdown (Loss)</b>	<b>1-month Maximum Gain</b>	<b>1-month Maximum Loss</b>
HFRI Convertible Arbitrage Index	10.0%	3.5%	-7.3%	3.3%	-3.2%
ML High Yield Master II	9.2%	7.0%	-12.0%	8.7%	-7.7%
Lehman Aggregate Bond Index	7.4%	3.9%	-5.2%	3.9%	-3.4%
S&P 500 Total Return Index	10.5%	14.4%	-44.7%	11.4%	-14.5%

*Sources: Pertrac and Hedge Fund Research Inc. (Hedge fund data is net of all fees.)*

- In terms of maximum drawdown, maximum 1M loss and Sharpe ratio, the Hedge Fund Research Convertible Bond Arbitrage Index did very well over 1990-2005 compared to other asset classes.
- However...

Performance 1996-end of 2013 based on 100 dollars invested in 1996 in a wide range of HF doing CBA strategies (data from Barclay)

**Cumululative performance of group of CBA HF (Source: Barclay)**





# Very bad performance in 2008

- In 2008, S&P 500 closed the year down **33%**.
- In 2008, FTSE closed the year down **34%**.
- In 2008, average Convertible Bond Arbitrage hedge fund (depends on measure used) closed the year down **35%**.
- Not great! (: Especially when hedge funds say they are market-neutral i.e. whether the market goes up or down, they make money.
- They lost more than an outright position in S&P 500!

- The **35%** fall figure may be optimistic. Hedge funds may try to “game” their results eg report into different data-bases, change names and strategies, close funds then re-open under a different name, etc.
- For example, a Hedge Fund Research (HFR) Investable Index (so something you could actually invest in and receive returns net of fees) reported a **49%** loss in 2008.

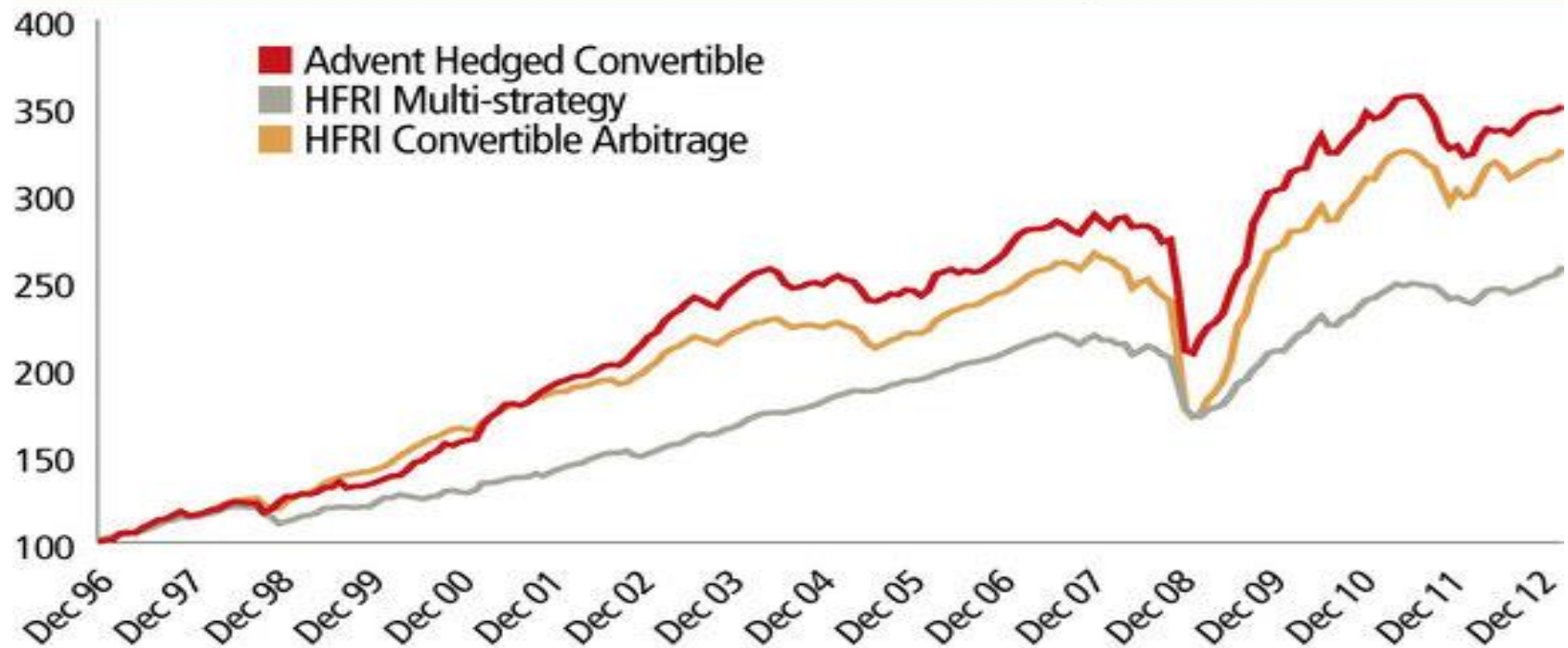
- A UBS index which is an index of CB prices (as opposed to returns on a CB arbitrage strategy) reported a **35.8%** fall in 2008. This corresponds to the return on a strategy which just buys (static position) and holds CBs.
- Hence, the “market-neutral” “arbitrage” strategies were no better (and if anything slightly worse) than buy-and-hold CBs or buy-and-hold an equity index (S&P 500).
- So not “market-neutral” or “arbitrage”. (:

- In general, CB Arbitrage strategies were hit by many things but new factors which had rarely been considered before 2007-2008 were funding risk and counterparty credit risk. The highly leveraged strategies before 2007-2008 were hit by margin calls, funding risks, haircuts on repos, etc.
- As hedge funds had funding problems, they had to liquidate long positions in CBs...

- ... which forced prices lower, which caused more counterparty credit risk concerns, more margin calls, more funding problems...
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- The next slide shows the performance of a Hedge Fund Research (HFRI) Multi-strategy Index (many different strategies used by hedge funds across different asset classes), a HFRI CB Arb Index and a CB Arb Index from one particular hedge fund (Advent).
- The data is from Advent Capital Management.

## Performance of convertible arbitrage



Sources: Advent Capital Management, Hedge Fund Research.

- All three show similar patterns (correlation).
- They all did badly in 1998 (Russia's default, Asian crisis, LTCM), 2002 (accounting scandals and bankruptcy at WorldCom and Enron), 2005 (GM)\*, 2008 (global financial crisis), 2010-2011 (European sovereign debt crisis).
- \*Credit of GM (General Motors) downgraded in 2005 at the same time as Kirk Kerkorian made an offer for GM stock. Most hedge funds were long bonds and short equity so lost on both sides.



- Hutchinson and Gallagher (2002), using data from 1990-2002, find that convertible bond arbitrage returns are positively correlated with equity markets in severe downturns i.e. They go down when the stock market crashes.

- What can financial economics tell us about hedge fund performance?:
- Hedge fund returns are adversely affected by money flows chasing past performance (Agarwal et al. (2011) and Goetzmann et al. (2003). This tend to result in investors “diving into the swimming pool just as the last bit of water drains out”. Or selling a poorly performing fund just before it starts to “bounce back”.

- Agarwal et al. (2011) regress the returns of CB Arbitrage Hedge Funds on the returns to three synthetic factors they construct (CARRY (our strategy 2), VOLATILITY (our strategy 3) and CREDIT (our strategy 5)). They find relative to these factors, abnormal (ie not explainable by these three factors) excess returns of 20 to 50 basis points per month (after all fees and expenses).
- These are sizeable abnormal returns.

- They add a factor SUPDEM which is the ratio of supply (total supply of CBs in the market) over demand (estimates of HF investments).
- They find once this factor is added, the abnormal returns are statistically indistinguishable from zero.
- One interpretation of this result is that returns not related to CARRY, VOLATILITY and CREDIT are simply a liquidity premium offered by the CB market.

- This is consistent with the notion that the larger the supply of CBs relative to the demand of CBs, the better the investment opportunities for CB arbitrage HF.
- A one-sigma increase in the *SUPDEM* factor has a positive impact on HF returns.

- Agarwal et al. (2011) argue that the losses in CB arbitrage HF in 2005 can be explained by the SUPDEM factor.
- Demand by HF increased from mid-2003 til end of 2004, while on the supply side, the new issuance of CBs fell over that period.
- This resulted in an enormous supply-demand imbalance, which led to a six sigma drawdown in the performance of CB arbitrage HF in the first half of 2005.

- Agarwal et al. (2011) conclude that a component of CBA returns are a liquidity premium offered by the CB market.
- Loncarski et al. (2007) analyse data for the Canadian market from 1998-2004. They find convertible bonds to be underpriced at the issuance dates (ie relatively cheap). Although they argue that CBA strategies positively affect markets by providing liquidity, (continued)...

- ... there is also a negative effect that short sales pressures (due to delta-hedging long positions in CBs) negatively affect both shareholders and existing bondholders.
- Henderson (2005) (based on data 1984-2004) also argue that CBs are underpriced at issuance.



- He considers two hypotheses – the market-timing (MT) hypothesis (firms have superior information and successfully market-time issues) and the private placement (PP) hypothesis (investors earn excess risk-adjusted returns as compensation for illiquidity, information production).
- MT hypothesis suggests negative risk-adjusted returns after issuance while the PP hypothesis suggests the opposite.

- His data strongly supports the PP hypothesis:
- CBs are cheap at issuance and CBA strategies profit from this: He finds:
- 1./ Newly issued convertible bonds outperform a Merrill Lynch benchmark of all (seasoned) bonds and the excess return is significant from the first through the sixth month after issuance.

- 2./ The post-issuance return patterns clearly differ across credit rating categories. The excess returns in the post issuance period are concentrated in the lower credit quality bonds.

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