

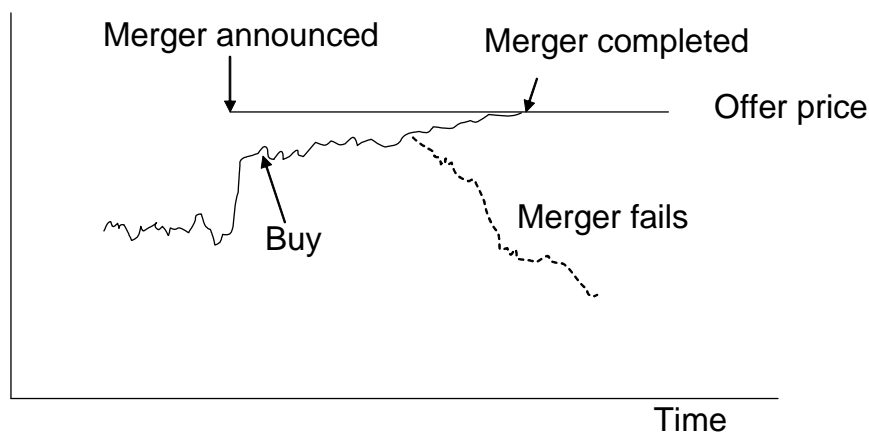
## 19.7 Hedge Fund Papers questions and answers

### 19.7.1 Mitchell and Pulvino

1. *Biggest points:*

- (a) Merger arbitrage looks like writing index put options – more likely to fail in down markets. Number one graph: Figure 2, 2143 and 4, 2157 . Thus, performance evaluation should compare MA to put option portfolios, and not count put premium as alpha.
  - (b) Transactions costs – commissions, bid/ask, limited market depth, illiquidity, need to diversify, small size of deals, difficulty in shorting, whether you get interest on short positions – are really important in evaluating these kinds of strategies! (And hard to do with typical data)
2. What is risk arbitrage or merger arbitrage? Is this the same as buying when you hear rumors there might be a merger announcement?

A: No



- (a) Strategy: For cash merger, (borrow and) buy the target. For stock merger, short acquirer stock too; less risk.
- (b) “Images of extraordinary profits and incredible implosions.”
- (c) Central point: More likely to fail in down markets. This is especially true of cash mergers. If you offer \$150 for a company and everyone’s stock declines, it is a much worse deal. If you offer \$150 of your own stock and both go down, so what.
- (d) Show Figure 1 2139 – of course you don’t know which one a particular deal is until it’s too late!
- (e) From a later paper “Merger arbitrage...essentially amounts to providing insurance to target firm shareholders against deal failures.” After announcement, you can sell to the arbitrageur to get the higher price for sure. In turn, the arbitrageurs make the price go up *at all* when the merger is announced, making the market more efficient.

3. What is the difference between RAIM and VWRA portfolio returns in Table IV?

A.:

- (a) Form portfolio of risk arbitrage investments. We have to do this to have returns over a long time and hence some betas. RAIM includes transaction cost guesses, VWRA does not. An issue for all of these is that at some times there are many deals and some times few, so the weighting varies over time. It's realistic to track a portfolio, so you can't invest in 1 deal one month, then 1000 the next.
- (b) RAIM 2148: Start with \$1M. Then,
  - i. No more than 10% in any deal
  - ii. Attempt to limit exposure when price impact is large.
  - iii. Fees, taxes, etc. 2150
  - iv. (It's hard to borrow for shorts, and loss of interest on short not included in costs).
- (c) For us: all of these are important issues for high frequency trading in the real world, whether or not they got it exactly right.
- (d) T II, Fig 3 2152 especially:

	VWRA	RAIM	VW
E	16.05	10.64	12.24
$\sigma$	9.29	7.74	15.08
Sharpe	1.06	0.57	0.40

Transactions costs and liquidity limits are really important for these kinds of strategies!

- (e) Figure 3, p. 2152. Important point: transactions costs matter! Commissions, bid/ask, limited market depth, illiquidity, need to diversify, small size of deals, difficulty in shorting, whether you get interest on short positions, the fact that deals come in bunches – are really important in evaluating these kinds of strategies! (And hard to do with typical data)

4. Do either the RAIM or VWRA portfolios study the profits of actual Risk Arbitrageurs?

A: No, this is “back-testing”, with sophisticated accounting of transactions costs, but not the profits of actual traders. (Huge data problem.)

5. What is the meaning of the fact that the two betas differ in Table IV? What kind of security does this suggest you use to benchmark merger “arbitrage?”

A: this is the *main table*. *About 0 beta in up markets, 0.5 beta in down markets*. It behaves like a bond plus short put option. See Figure 4 2157. (about 4% out of money, with the 4% threshold).

Warning: All the evidence is in 4 data points! (Top of Figure 4). That's not necessarily bad – warning against “dropping outliers” in regressions, they are often the most interesting data points! Things could be a lot worse in *really* down markets. Down beta is poorly measured. Earthquakes are poorly measured – there are limits to purely statistical risk management (as lots of people found out in 1998 and 2008!).

6. The  $\alpha_{Mkt\ High}$  in Table IV is positive and significant. This is also where the bent line of Figure 4 intersects the vertical axis, the intercept of the bent line. So, do we conclude that MA is profitable after accounting for its option-like component?

A: NO! Table IV alphas are not meaningful. *For alphas to be meaningful, the things on the right have to be returns.* As on p. 2155, middle “Note however that because of the nonlinear relationship between risk arbitrage returns and market returns, these intercepts cannot be interpreted as excess returns.” Put another way, this shows that the hedge fund *payoffs* look like option payoffs, but option *payoffs* are not option *returns*. We have to account for the premium.

7. If not, how do MP answer this question, and how much alpha do they find?

A: to answer the alpha question, we have to put option returns on the right hand side. That’s what the “contingent claims analysis” 2162-2163 does – essentially takes  $R = \alpha + bR^{\text{put option}} + \beta R^m + \varepsilon$ . Now  $\alpha$  really is  $\alpha$ .

- (a) Calculating  $R^{\text{put option}}$  using Black Scholes calculation of the value of the put option leaves 33bp alpha. 2163
- (b) Using actual put prices (replicating with actual puts) gives 29bp alpha (implied volatility of out of the money puts is higher than Black Scholes says).
- (c) The alpha number is very rough and not an important point. *The idea of the calculation is important. Compare risk arbitrage to writing put options. This is the right performance attribution model.* “These results are consistent with the notion that the excess return in risk arbitrage reflects compensation for providing liquidity in merger stocks especially during market downturns.” (alpha may reflect FF3F exposure. Targets are smaller and typically value. Aggrwal and Naik)

8. What is the single most important number in Table V?

A: Table V gives supporting information: deals are, in fact, less likely to go through in down markets. Thus, the number next to  $R_{Mkt}$ , -1.6841 and -1.7034. It’s also interesting that cash deals are more likely to fail, 0.1797. I’d like to see a separate regression for cash deals, or an interaction term  $cash \times R_{mkt}$ . I bet the *slope* on  $R_{Mkt}$  is larger for cash deals.

9. In Table VI 2159, the effect seems much stronger in cash transactions. Does this argue against their story; i.e. should the betas be the same any way you do it?

A: No, this validates their story. As you would expect, the up/down market beta effect is much more important for cash than stock transactions. (If the market goes down, a cash transaction looks worse, but since both stocks go down a stock acquisition doesn’t change attractiveness.) For cash, the down market beta is 0.77, for stock it’s only 0.15. JC: Should have broken these two out from the start

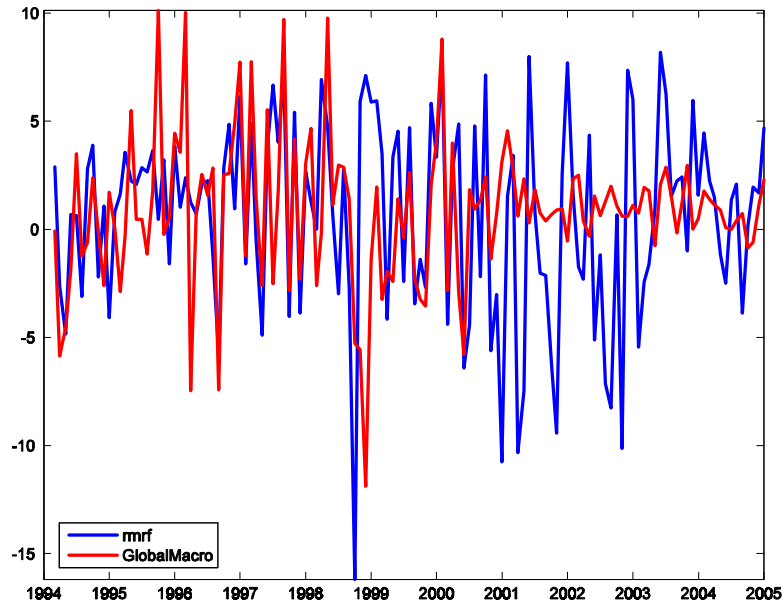
10. How is Figure 5 / Table VIII looks like a repeat of Figure 4 / Table IV. How are they different? What are the advantages and disadvantages of the two approaches?

A: Figure 5 2166 and Table VIII use hedge fund return data. This includes real-world transactions cost. But it includes huge survivor bias.

11. What are the implications of the  $R^2$  values in the tables?
- A: The  $R^2$  are quite low – .1 - .5. This is nothing like the 0.9 in previous work. Low  $R^2$  of performance evaluation regressions will be typical of hedge fund work. This means at a minimum there is a lot of residual/idiosyncratic risk. It also means there may be more systematic risks we haven't discovered. For example, risk arb undoubtedly has smb and hml exposure because targets are smaller and valuer than acquirers.
12. Conclusions
- (a) Big point: you see how option-like return can emerge from a dynamic pure equity strategy.
  - (b) Merger arbitrage looks like writing index put options – more likely to fail in down markets. Number one graph: Figure 2, 2143 and 4, 2157 .
  - (c) You should benchmark such returns (at least) to option-like portfolios and not count the put premium as alpha.
  - (d) A lot of residual ( $\epsilon$ ) risk.  $R^2$  are low.
  - (e) Transactions cost – commissions, bid/ask, limited market depth, “price pressure”, illiquidity, need to diversify, small size of deals, difficulty in shorting, whether you get interest on short positions – are *hugely* important in evaluating these strategies. Alpha in the 100% per year range disappears with a few sensible corrections.
  - (f) Managing transactions cost is #1 issue if you want to do / evaluate hedge fund type strategies!
  - (g) 2171 bottom, last pp. Their last alpha is 2% / year is “substantial”? But MP started their own fund!
13. Last JC comment: Providing liquidity is good. Writing put options is good. Someone should be providing “catastrophe insurance” and earning a premium to do so. Issue: does merger arbitrage do much more than generic writing of index put options? – Is there some additional “premium for providing liquidity [to mergers], particularly during severe market downturns?” Is merger arb something special or arbitrated against index puts, much as index futures and the cash index are arbitrated?
14. Note: If I were hiring a merger arb fund for its alpha skill, I'd want 1) hedge market risk using index futures for cash deals (hedge the beta of acquired stock); and maybe hedge its value, size premia as well 2) hedge size, value premia for stock deals, so it's not just short big, growth, buy small, value, 3) buy index puts, especially for cash deals, to hedge the implicit put option. Actually, I would do my own hedging, but make the fee (2+20) contingent on these benchmarks, not raw performance.
15. Note: does adding lagged betas change things?

### 19.7.2 Asness et al do hedge funds hedge

1. Read p. 9. Excellent prose; why you should care about beta (and beyond market too)
2. In simple regressions, do hedge fund indices display zero betas on the S&P500 index?  
A: Exhibit 2: Notice already some decent betas, in event, market neutral, long/short, emerging markets.
3. Why, according to Asness & co., might hedge funds seem to have returns that are smoother and lower beta than in fact?  
A: p.10, stale (unintentional) or “managed” (intentional, i.e. lying) prices. JC: also option-like strategies
4. What are the “monthly annualized standard deviation” and “quarterly annualized standard deviation” in Exhibit 3? What do you learn if they are not the same? (A formula is a good idea here)  
A: reminder:  $var(r_t + r_{t+1}) = var(r_t) + var(r_{t+1}) + 2cov(r_t, r_{t+1})$ . If  $\rho = 0$ , then  $var(r_t + r_{t+1}) = 2var(r)$ ; variance scales with horizon, standard deviation scales with the square root of horizon. Thus, the “monthly annualized standard deviation” is  $\sqrt{12}\sigma(r_t)$ , the “quarterly annualized standard deviation” is  $\sqrt{4}\sigma(r_t + r_{t+1} + r_{t+2})$ . When they are not the same, you learn that  $\rho \neq 0$ — returns are correlated over time. In turn, this is a sign of “stale pricing” among other things.
5. If returns were independent over time, what difference would adding lagged returns make to beta calculations?  
A: none. They would be uncorrelated right hand variables, and there could be no correlation between  $R_{t-1}^m$  and  $R_t^i$ . Lagged betas would all be zero. Real lagged betas mean that you can predict  $R_t^i$  from  $R_{t-1}^m$  and make money!
6. Overall, when we add lagged betas, do hedge fund betas seem to increase, decrease, or stay the same?  
A: Exhibit 4, especially compare column 1 and column 4 of 4b. A lot! Notice also that more beta means less alpha. Global macro October 1998 gives an example of lagged betas. (Interestingly, this has changed in the data update)



7. Are alphas meaningful as we add lagged betas? What happens to alphas as we add lagged betas?

A: Yes, this is not like up down betas. The interpretation is that this is real beta, but just slow measurement on the left hand side. Note decrease in alpha as we increase beta from Exhibit 3 to Exhibit 4..

8. How could a fund that is one for one long-short equities (one \$ short for every \$ long) nonetheless have significant betas?

A: p. 13. If you short low beta stocks and long high beta stocks, your portfolio gets a beta. Actually, this is now called “beta arbitrage.”

9. Asness & co. find that upmarket and downmarket betas differ. How do they measure upmarket and downmarket betas? Is this a big or small effect?

A: p. 14. Exhibit 5.

10. What interpretation do Asness & co. give to the difference between up and down market betas? Can you think of a different interpretation?

A; Asness & co. (p. 14) say only it’s evidence of intentional manager smoothing. (They point to the greater effect of down betas in lags) Mitchell Pulvino etc. would say it’s the index-option like feature of hedge fund returns. Hsieh would say they synthesized a lookback option, which accounts for the importance of lagged betas too.

11. Notice how higher betas make the alphas lower . Alas, you can’t use the alphas on the up/down regressions; you need an option return calculation. They call for more styles

12. Conceptual issue (p. 10, bottom left). Suppose a manger moves in and out of the market, according to some signal, and does so correctly. Is this alpha? Should we try to correct for time-varying beta in our performance attribution?

A: A good debate point. I think not. If you knew about the movement in and out, and you hedged – you’d lose the signal! If you know where the market is going and have  $\beta > 0$  for ups and  $\beta < 0$  for down, you can make a fortune. On the other hand, if it’s a rule based on an observable signal –  $w = a + b(D/P)_t$  for example – then you could make the rule a “style.” On the other hand, knowing what regression to run is skill. You need to know the *average* beta for risk management..

13. Note to self: Think more about fees. What is the value of the call option in 2+20? How much more are you really paying for alpha since fees are charged on beta? What about the Asness argument that 5% of a leveraged portfolio is the same as 1% on long-only? That’s obviously too simple and ignores the option value of the fees. “selection” is blurring.