Portfolio Managment: Homework 8

Gal Skarishevsky, Nathan Matare, Brian Thompson, Lior Sahaf

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# B.1. Estimating E and V by the sample estimates.

stuff

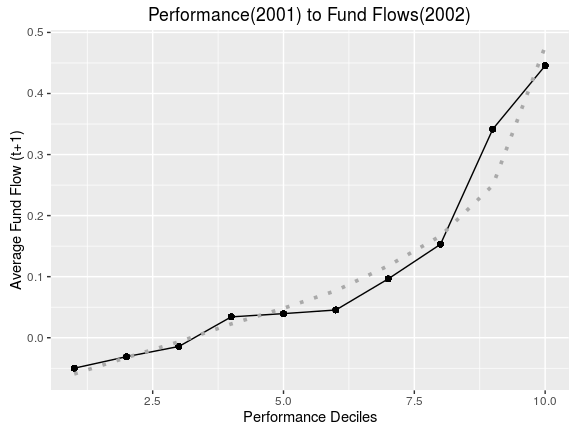
# B.2. Estimating the Performance-Flow Relation.

We write the function '' that computes the answers to our desired questions:

EVAL\_performance\_to\_flow <- function(year, graph = FALSE, ...){  
 data <- transpose(rbind(rets[Date == year], flows[Date == year + 1]))  
 colnames(data) <- c("returns", "inflows")  
 data <- na.omit(data[-1, ]) # remove year and remove NAs  
  
 data <- data[order(returns, decreasing = TRUE)]  
 data[ ,group\_interval := cut\_number(returns, n = 10)]  
 data[, decile := as.integer(group\_interval)]  
 data[ ,avg\_returns := mean(returns), by = group\_interval]  
 data[ ,avg\_flows := mean(inflows), by = group\_interval]  
  
 data\_per\_decile <- data[!duplicated(avg\_returns)]  
 linear <- lm(avg\_flows ~ avg\_returns + I(avg\_returns ^ 2), data = data\_per\_decile)  
  
 data\_per\_decile[ ,hat\_avg\_flows := linear$fitted][ ,c("returns", "inflows") := NULL]  
  
 estimates <- rbind(  
 alpha\_hat = summary(linear)$coefficients[,'Estimate'][1],   
 beta\_hat = summary(linear)$coefficients[,'Estimate'][2],   
 charlie\_hat = summary(linear)$coefficients[,'Estimate'][3],  
  
 alpha\_se = summary(linear)$coefficients[,'Std. Error'][1],   
 beta\_se = summary(linear)$coefficients[,'Std. Error'][2],   
 charlie\_se = summary(linear)$coefficients[,'Std. Error'][3]  
 ); colnames(estimates) <- year  
  
 data <- merge(data, data\_per\_decile)  
  
 if(graph){  
  
 p <- ggplot(data = data, aes(decile, group = 1)) +   
 geom\_point(aes(y = avg\_flows), color = "black") +   
 geom\_line(aes(y = avg\_flows)) +  
 geom\_line(aes(y = hat\_avg\_flows), color = "darkgrey", linetype = "dotted", size = 1.3) +  
 ggtitle(paste("Performance(", year, ") to Fund Flows(", year + 1, ")", sep = "")) +  
 labs(x = "Performance Deciles", y = "Average Fund Flow (t+1)")   
 print(p)  
 }  
  
 return(list(data = data\_per\_decile, estimates = estimates))  
}

## a) i - iv.

We evaluate the performance-fund for 2001 and observe a convex pattern. As expected, the better performing the fund in the previous year, the more new funds flow into it. Further, our estimates (fitted\_values) are highly correlated with the real values. This linear model explains much of the variation (in-sample, of course). All three of the coefficients appear to be highly significant.



Average: Returns, Flows, Fitted Values by Decile

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| group\_interval | decile | avg\_returns | avg\_flows | hat\_avg\_flows |
| (0.0877,0.735] | 10 | 0.1781 | 0.4455 | 0.4770 |
| (0.00687,0.0877] | 9 | 0.0426 | 0.3418 | 0.2497 |
| (-0.041,0.00687] | 8 | -0.0191 | 0.1531 | 0.1667 |
| (-0.0813,-0.041] | 7 | -0.0610 | 0.0963 | 0.1178 |
| (-0.118,-0.0813] | 6 | -0.1005 | 0.0454 | 0.0771 |
| (-0.146,-0.118] | 5 | -0.1322 | 0.0395 | 0.0482 |
| (-0.185,-0.146] | 4 | -0.1642 | 0.0342 | 0.0226 |
| (-0.23,-0.185] | 3 | -0.2077 | -0.0143 | -0.0067 |
| (-0.294,-0.23] | 2 | -0.2577 | -0.0310 | -0.0324 |
| [-0.722,-0.294] | 1 | -0.3717 | -0.0499 | -0.0594 |

Coefficients and Standard Errors

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | alpha\_hat | beta\_hat | charlie\_hat | alpha\_se | beta\_se | charlie\_se |
| 2001 | 0.191 | 1.3 | 1.7 | 0.017 | 0.124 | 0.46 |

## b) i.

We write the function '' and compute our Fama-MacBeth estimates:

years <- as.numeric(unlist(rets[,'Date'][-11])) # remove 2002  
performance <- lapply(years, EVAL\_performance\_to\_flow)  
  
getStatSignif <- function(coef, ...){  
 FM\_alpha\_hat <- do.call(sum, lapply(performance, function(x)   
 x$estimates[paste(coef, "\_hat", sep = ""),])) / 10  
 FM\_alpha\_se <- sd(unlist(lapply(performance, function(x)   
 x$estimates[paste(coef, "\_se", sep = ""),]))) / sqrt(10)  
 summary\_stat <- cbind(FM\_alpha\_hat, FM\_alpha\_se)  
 colnames(summary\_stat) <- NULL; rownames(summary\_stat) <- coef  
 return(summary\_stat)  
}

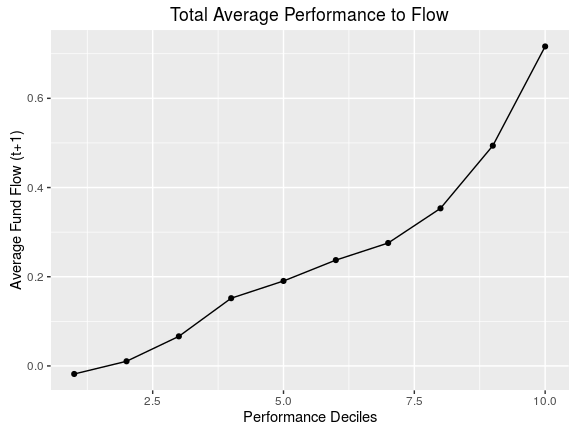
Confirming our results from above, the Fama-Macbeth approach is significant for all three coefficients, implying that the convexity pattern(charlie) is statistically signficant as well.

Fama-MacBeth Estimates

|  |  |  |
| --- | --- | --- |
|  | Estimate | Standard Error |
| alpha | 0.0433 | 0.0094 |
| beta | 1.5640 | 0.0936 |
| charlie | 4.4437 | 0.4863 |

## b) ii

Next, we average the performance-flow per decile across years. We, again, observe a convex pattern:



## c) i.

(A) = 1(0.01) + 0(0) = 0.01  
(B) = -0.25(0.60) + 0.25(0.40) = -0.05

Thus, choose A.

## c) ii.

Given,

Initial investment size = 100M  
 = 0.04  
 = 1.56  
 = 4.44

Scenario A:  
 = 0.04 + 1.56 \* 0.01 + 4.44(0.01^2) = 0.05  
Year-end investment size = 105.6  
(A) = 1.05M

Scenario B:  
 = 0.04 + 1.56 \* 0.25 + 4.44(0.25^2) = 0.7075  
Year-end investment size = 170.75  
Fee(good) = 1.70M

= 0.04 + 1.56 \* -0.25 + 4.44(-0.25^2) = -0.0725  
Year-end investment size = 0.9275  
Fee(bad) = 0.9275M

(B) = 0.40(1.70) + 0.60(0.92) = 1.23

Thus, choose B.

## c) iii.

Due to the quadractic term and incentive(1% fee after inflows) structure, the potential upside for investment B, even after factoring in the investment's riskyness (-0.25), is greater (1.23 > 1.05). Thus, a short term looking money manger would have greater incentives to take risky bets given their expected payoff.

## d)

New money chases hot money.

There holds a strong quadratic relationship between a funds past return and its future inflows. Although it may be that these well-performing funds continue to perform well into the future (more analysis needed), given our class discussion, notes, and referenced papers, this seems unlikely. And, noting that incentives are tied not only to raw return performance but also fund inflows, it appears that money managers stand to gain, in expectation, significant upside on risky investments.