Portfolio Managment: Homework 4

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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 '`EVALperformancetoflow`' that computes our desired question answers:

```
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.

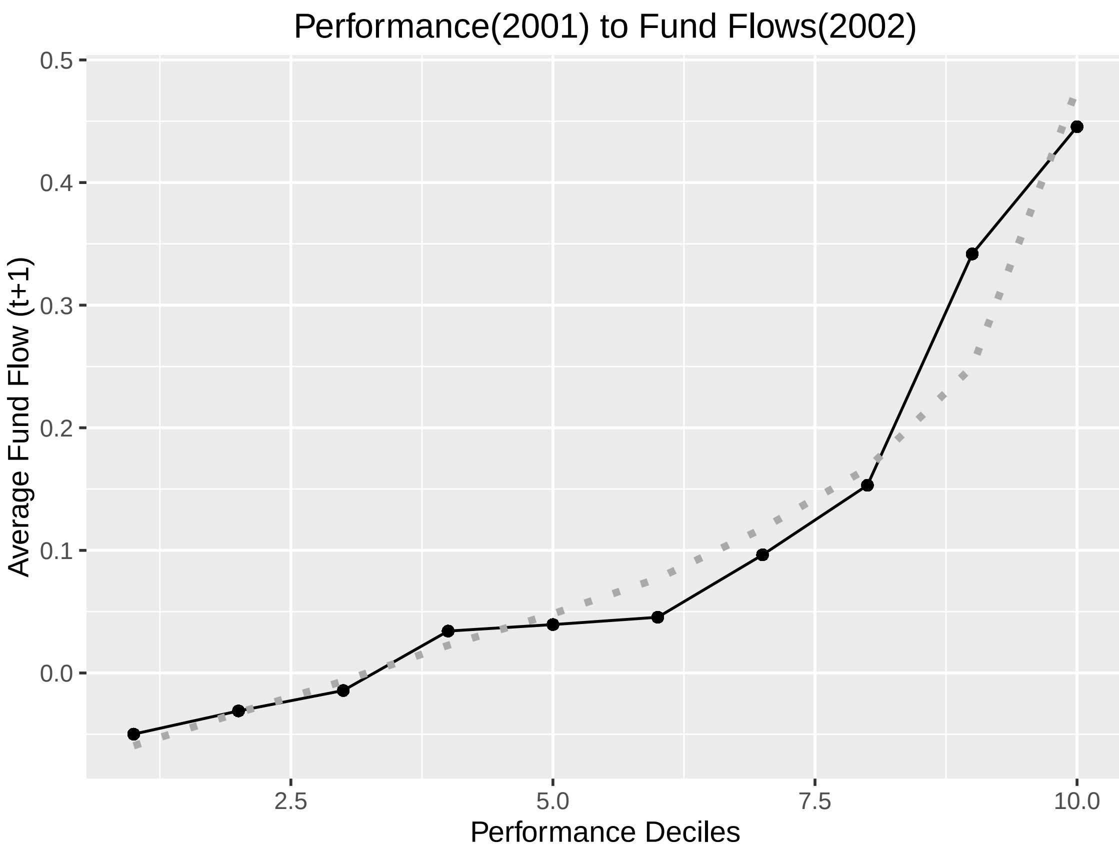


Table 1: Average: Returns, Flows, Fitted Values by Decile

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

group_interval	decile	avg_returns	avg_flows	hat_avg_flows
(-0.294,-0.23]	2	-0.2577	-0.0310	-0.0324
[-0.722,-0.294]	1	-0.3717	-0.0499	-0.0594

Table 2: 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 '`getStatSignif`' 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)
}
```

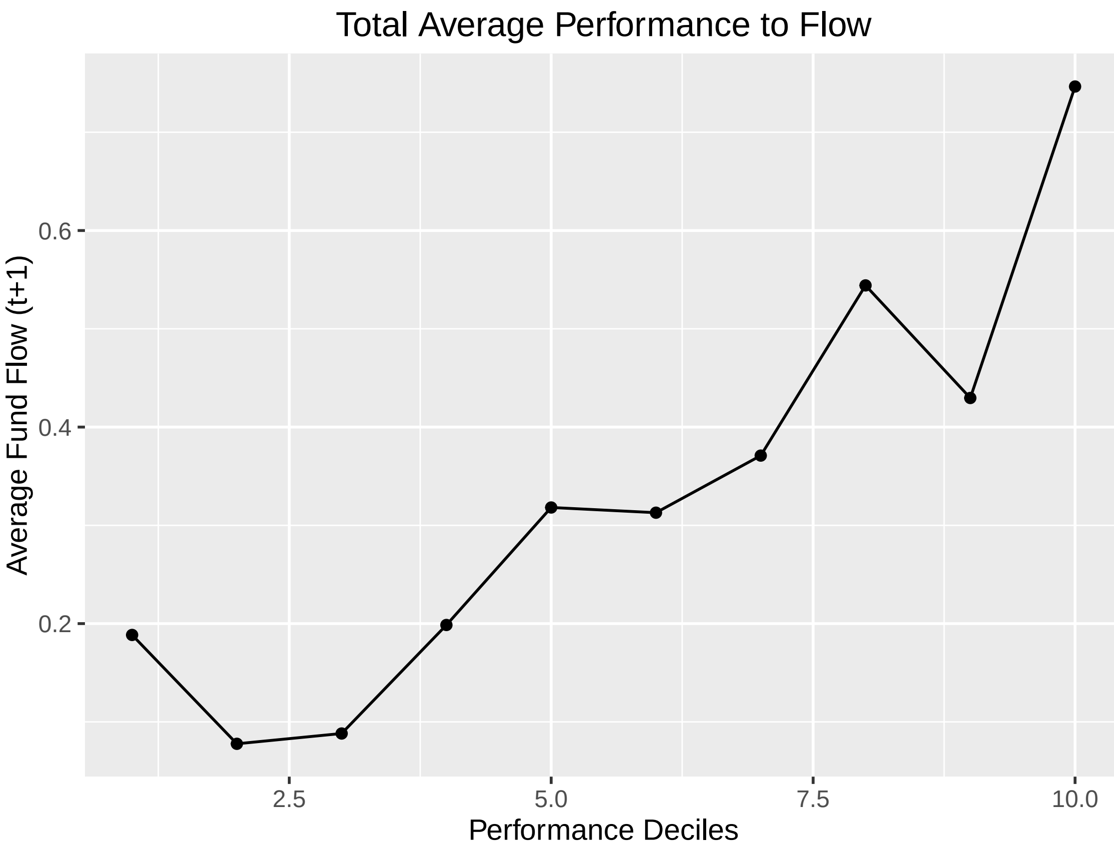
Confirming our results from above, the Fama-Macbeth approach is significant for all three coefficients, implying that the convexity pattern(charlie) is statistically signficant as well.

Table 3: 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.

$\mathbb{E}$(A) = 1(0.01) + 0(0) = 0.01
$\mathbb{E}$(B) = -0.25(0.60) + 0.25(0.40) = -0.05

Thus, choose A.

c) ii.

Given,

Initial investment size = 100M
$\hat{a}$ = 0.04
$\hat{b}$ = 1.56
$\hat{c}$ = 4.44

Scenario A:
$\hat{F_A}$ = 0.04 + 1.56 * 0.01 + 4.44(0.01ˆ2) = 0.05
Year-end investment size = 105.6
$\mathbb{E}_{\mathbb{A}}$(A) = 1.05M

Scenario B:
$\hat{F_B}$ = 0.04 + 1.56 * 0.25 + 4.44(0.25ˆ2) = 0.7075
Year-end investment size = 170.75
Fee(good) = 1.70M

$\hat{F_B}$ = 0.04 + 1.56 * -0.25 + 4.44(-0.25ˆ2) = -0.0725
Year-end investment size = 92.75 Fee(bad) = 9.275M

$\mathbb{E}(\mathrm{B}) = 0.40(1.70) + 0.60(0.92) = 1.23$

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.