

# Intermediary Capital Risk Everywhere

a nontechnical summary of

Intermediary Asset Pricing: New Evidence from Many Asset Classes

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## Question

- ▶ Why do some financial assets earn consistently larger average returns than others?
- ▶ In rational markets, such return differences are explained by differences in risk exposures (betas) to systematic risk factors
- ▶ Parsimonious set of risk factors that can rationalize observed cross-sectional variation in average returns

## Our Answer

- ▶ We find that a simple two-factor extension to the Capital Asset Pricing Model (CAPM), which in addition to market risk accounts for exposure to intermediary capital risk, is remarkably successful in explaining return differences across a wide array of asset classes
- ▶ **Intermediary capital risk** appears to be priced everywhere
- ▶ Practical implications for
  - ▶ Asset risk measurement
  - ▶ Cost of capital
  - ▶ Valuation
  - ▶ Wealth management

# Capital asset pricing model (CAPM, Sharpe 1964)

Market risk is all that matters

- ▶ Risk is measured by covariation with the market portfolio  $m$

$$\beta_{im} = \frac{Cov(r_i, r_m)}{Var(r_m)}$$

- ▶ The risk premium on the market portfolio  $m$  is

$$E[r_m] - r_f = A \times Var(r_m)$$

- ▶ The risk premium on individual assets is proportional to the risk premium on the market portfolio

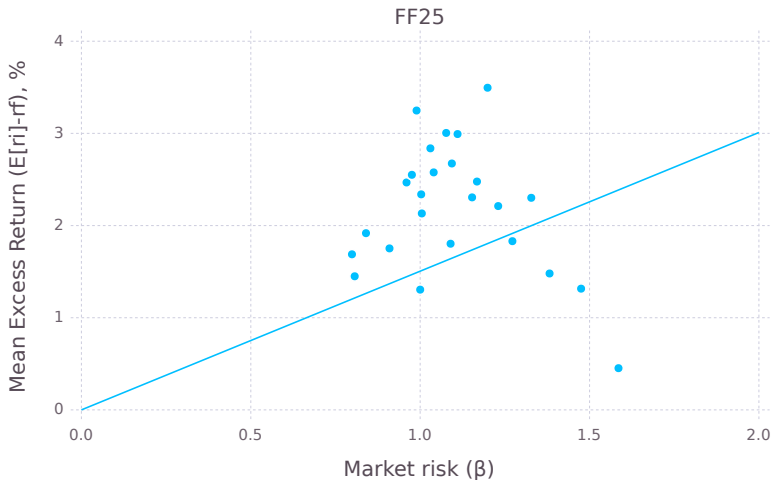
$$E[r_i] - r_f = \frac{Cov(r_i, r_m)}{Var(r_m)} (E[r_m] - r_f) = \beta_{im} (E[r_m] - r_f)$$

# CAPM is theoretically appealing

- ▶ Many assumptions lead to its main results
- ▶ Intuitive
  - ▶ Money is most useful when the average household is hungry, i.e. when the market crashes
  - ▶ Investor prefers assets pay off in bad times (low  $\beta_{im}$ )
  - ▶ Assets that pay off in good times (high  $\beta_{im}$ ) must offer higher expected returns

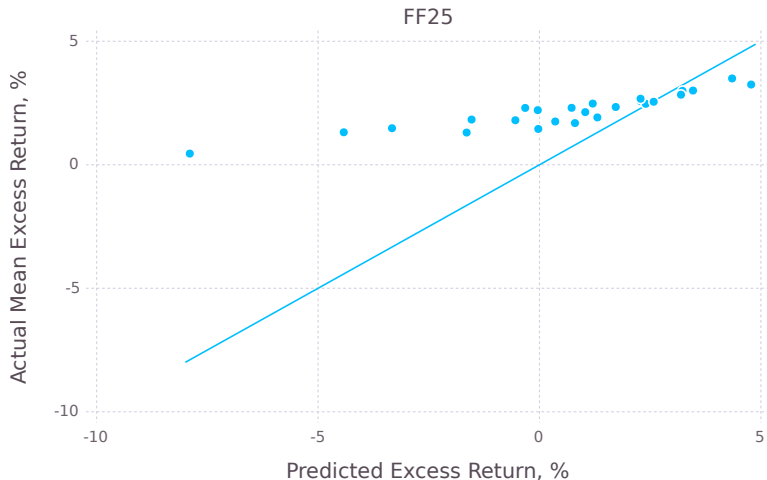
# CAPM does poorly in the data

Security market line



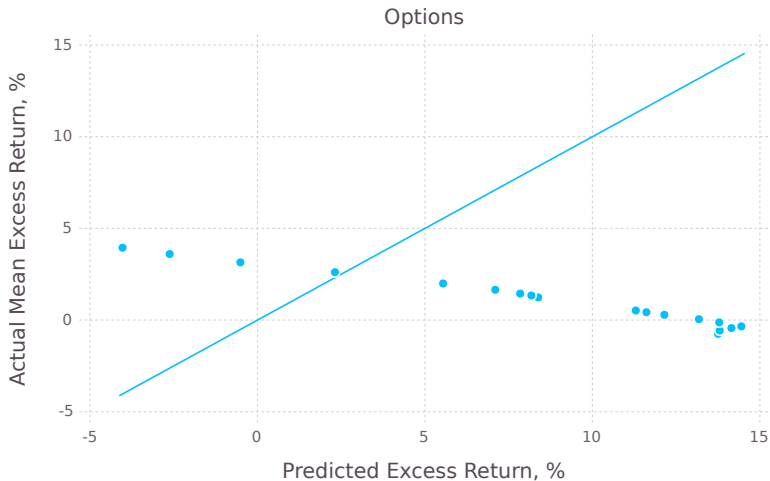
# CAPM does poorly in the data

Mean equity returns are very different from predicted ones (should line up on 45 degree line)



# CAPM does poorly in the data

Even worse for more exotic assets





## Fama-French 3 factor model (1993)

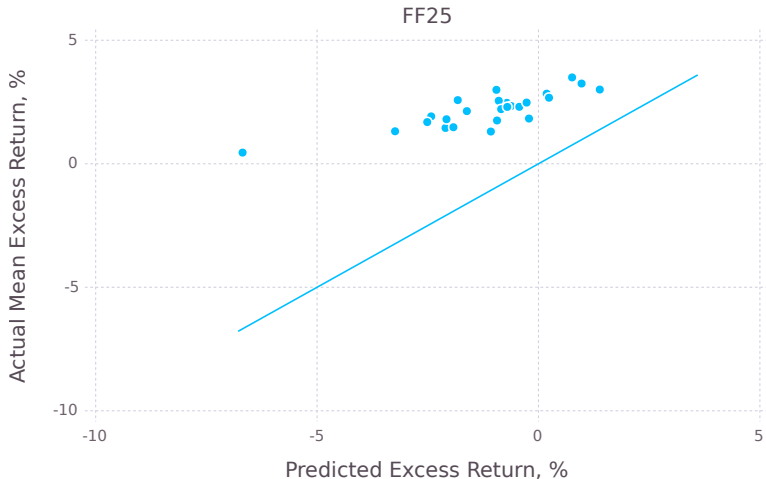
Fama and French went fishing and discovered a 3 factor model that works

- ▶ The risk premium on individual assets depends on market risk premium + value premium + size premium

$$E[r_i] - r_f = \beta_{im} (E[r_m] - r_f) + \underbrace{\beta_{iv} E[r_{value} - r_{growth}]}_{\text{value premium}} + \underbrace{\beta_{is} E[r_{small} - r_{big}]}_{\text{size premium}}$$

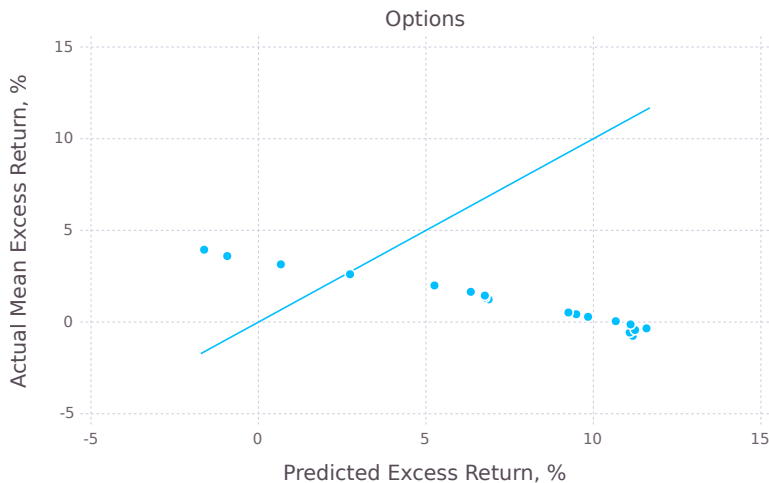
## FF3F lacks theory but fit equities data better

Mean equity returns are very different from predicted ones (should line up on 45 degree line)



# FF3F still does poorly outside stocks

Especially bad on exotic assets



## Intermediary asset pricing

- ▶ **Intermediary asset pricing** shifts focus from households to financial intermediaries
- ▶ Intermediaries are more likely to be marginal investors
- ▶ Intermediaries are active in almost all asset classes
  - ▶ Households are only active in some
  - ▶ Especially sophisticated asset classes like Options or CDS

## Intermediary capital risk factor is theoretically motivated

- ▶ Theory proposes some proxies for intermediaries' marginal value of wealth
  - ▶ **Intermediary net worth**
  - ▶ **Capital ratio** (=Equity/Asset) measures financial distress: the lower the capital ratio, the higher the marginal value of wealth
- ▶ **Primary Dealers**; constructing intermediary capital ratio

$$ICR \equiv \frac{\sum_i MarketEquity_{it}}{\sum_i (MarketEquity_{it} + BookDebt_{it})}$$

## Our 2 factor model

- ▶ The risk premium on individual assets depends on market risk premium + intermediary capital risk premium

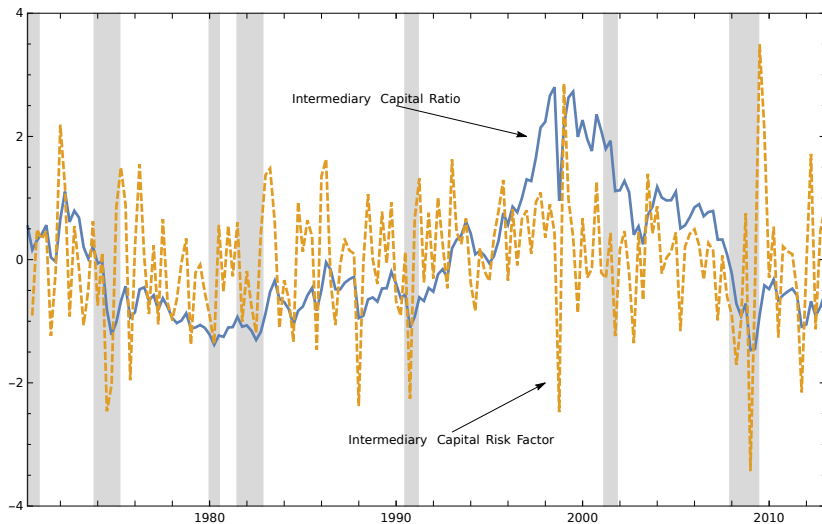
$$E[r_i] - r_f = \beta_{im} (E[r_m] - r_f) + \underbrace{\beta_{ICR} E[\Delta ICR]}_{\text{intermediary capital premium}}$$

- ▶ This simple extension to the CAPM makes a big difference
- ▶ Intuitive
  - ▶ Money is most useful when the average household intermediary is hungry poorly capitalized
  - ▶ Prefer assets that pay off in bad times (low  $\beta_{ICR}$ )
  - ▶ Assets that pay off in good times (high  $\beta_{ICR}$ ) must offer higher expected returns

## Primary dealers as of February 11, 2014

Primary Dealer	Holding Company	Since
Goldman, Sachs & Co.	Goldman Sachs Group, Inc.	1974
Barclays Capital Inc.	Barclays PLC	1998
HSBC Securities (USA) Inc.	HSBC Holdings PLC	1999
BNP Paribas Securities Corp.	BNP Paribas	2000
Deutsche Bank Securities Inc.	Deutsche Bank AG	2002
Mizuho Securities USA Inc.	Mizuho Financial Group, Inc.	2002
Citigroup Global Markets Inc.	Citigroup Inc.	2003
UBS Securities LLC	UBS AG	2003
Credit Suisse Securities (USA) LLC	Credit Suisse Group AG	2006
Cantor Fitzgerald & Co.	Cantor Fitzgerald & Co	2006
RBS Securities Inc.	Royal Bank of Scotland Group	2009
Nomura Securities International, Inc.	Nomura Holdings, Inc.	2009
Daiwa Capital Markets America Inc.	Daiwa Securities Group Inc.	2010
J.P. Morgan Securities LLC	JPMorgan Chase & Co.	2010
Merrill Lynch, Pierce, Fenner & Smith	Bank of America Corporation	2010
RBC Capital Markets, LLC	Royal Bank Holding Inc.	2010
SG Americas Securities, LLC	Societe Generale	2011
Morgan Stanley & Co. LLC	Morgan Stanley	2011
Bank of Nova Scotia, NY Agency	Bank of Nova Scotia	2011
BMO Capital Markets Corp.	Bank of Montreal	2011
Jefferies LLC	Jefferies LLC	2013
TD Securities (USA) LLC	Toronto-dominion Bank	2014

# Intermediary capital ratio (State Variable and Factor)

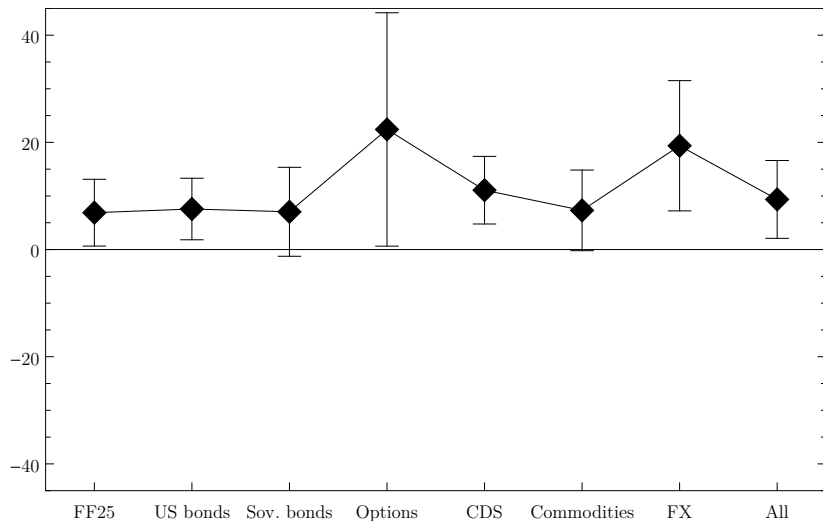




# Intermediary asset pricing model fits data well across many assets classes

- ▶ Apply the standard cross-sectional asset pricing tests for each asset class separately
  - ▶ Fama-French 25 portfolios (equity), US Bonds (Government and Corporate), Sovereign Bonds, Options, CDS, Commodities, and FX markets
- ▶ Positive prices of “intermediary capital risk” for all asset classes
  - ▶ Positive price: intermediaries value one dollar more in the state of low capital
- ▶ Each market identifies a price of intermediary capital risk...theory says they should be equal
  - ▶ We do find quantitatively similar implied prices of risk (9% per quarter) in all asset classes

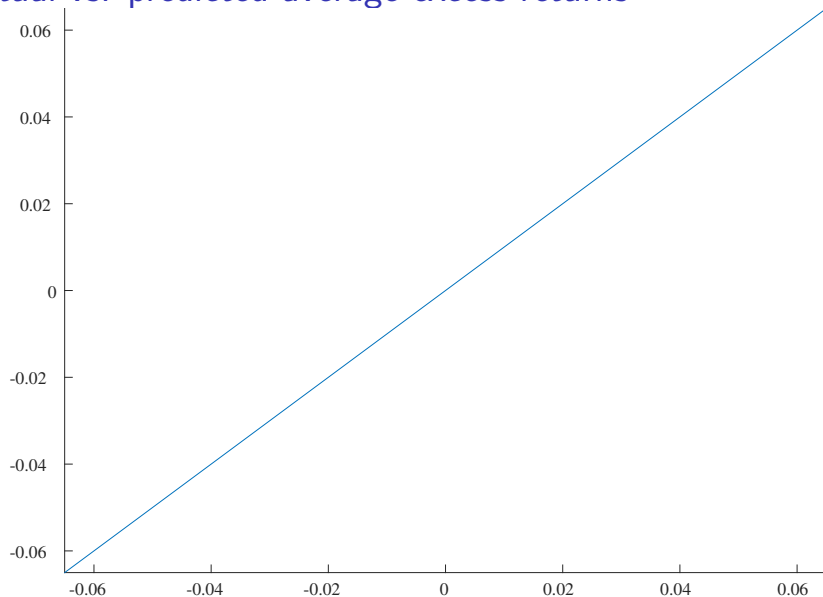
# Intermediary capital risk premium by asset class



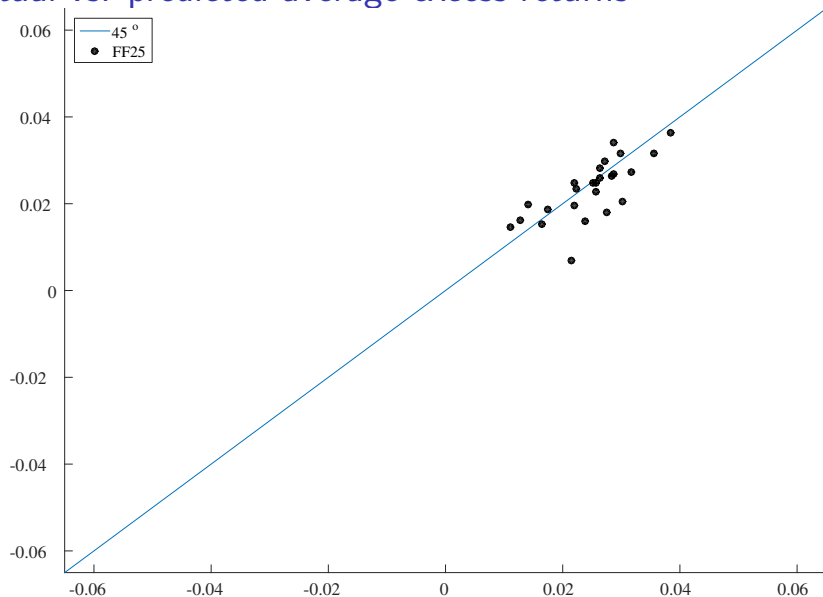
# Cross-sectional results by asset class 1970Q1–2012Q4

	FF25	US bonds	Sov. bonds	Options	CDS	Commod.	FX	All
Capital	6.88 (2.16)	7.56 (2.58)	7.04 (1.66)	22.41 (2.02)	11.08 (3.44)	7.31 (1.90)	19.37 (3.12)	9.35 (2.52)
Market	1.19 (0.78)	1.42 (0.82)	1.24 (0.32)	2.82 (0.67)	1.11 (0.41)	-0.55 (-0.25)	10.14 (2.17)	1.49 (0.80)
Intercept	0.48 (0.36)	0.41 (1.44)	0.34 (0.33)	-1.11 (-0.31)	-0.39 (-2.77)	1.15 (0.83)	-0.94 (-0.83)	-0.00 (-0.00)
$R^2$	0.53	0.84	0.81	0.99	0.67	0.25	0.53	0.71
MAPE, %	0.34	0.13	0.32	0.14	0.18	1.15	0.44	0.63
MAPE-R, %	0.40	0.26	0.45	0.68	0.39	1.40	0.62	0.63
RRA	2.71	3.09	2.52	8.90	3.61	2.88	8.26	3.69
Assets	25	20	6	18	20	23	12	124
Quarters	172	148	65	103	47	105	135	172

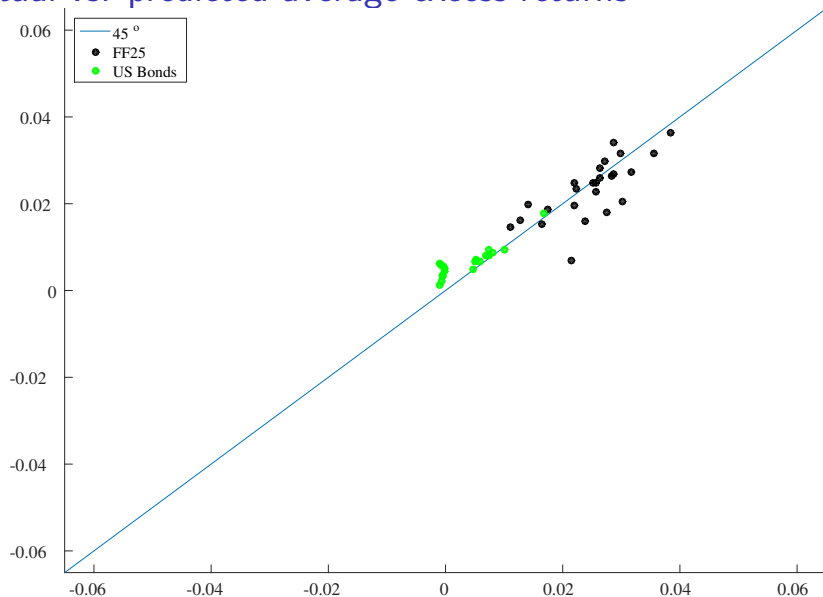
## Actual vs. predicted average excess returns



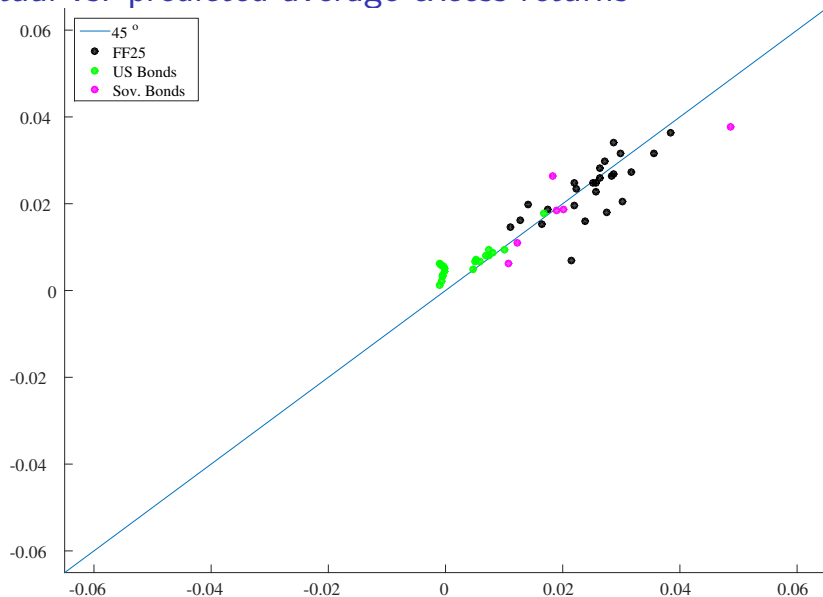
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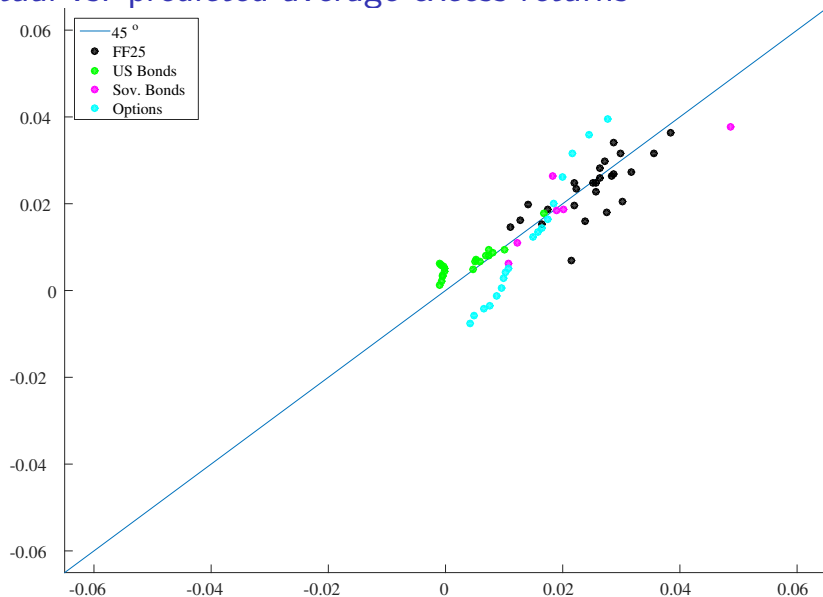
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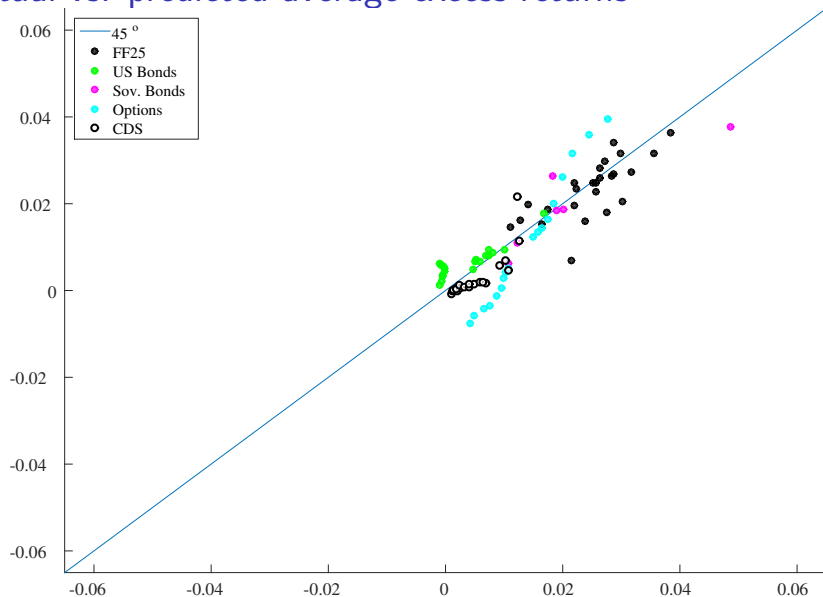


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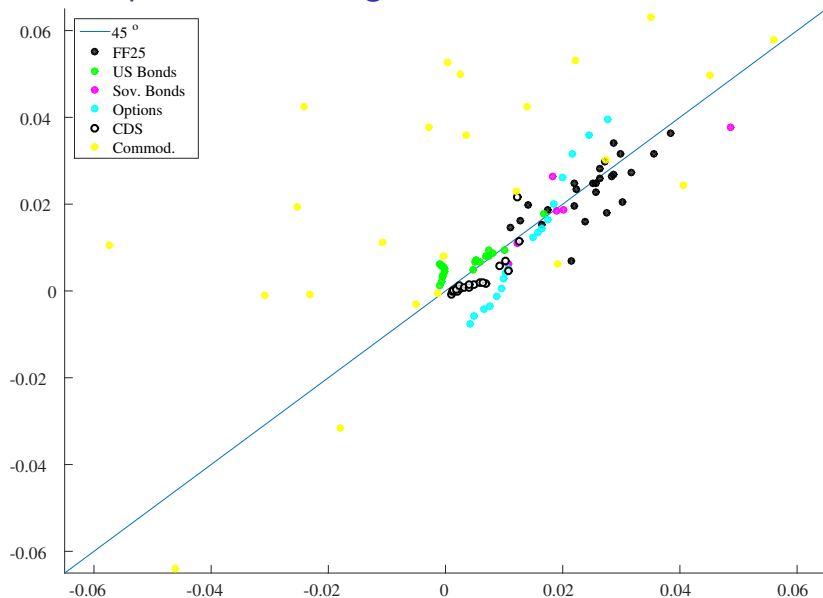




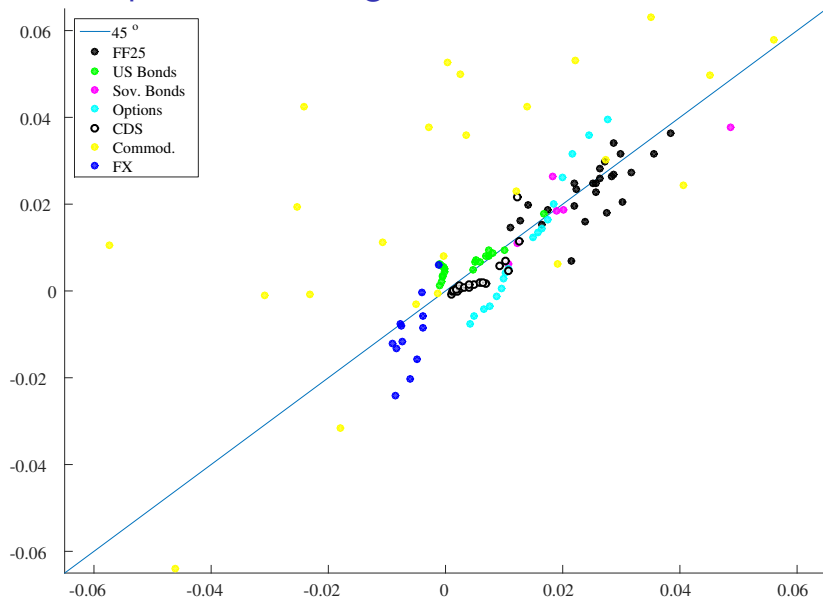
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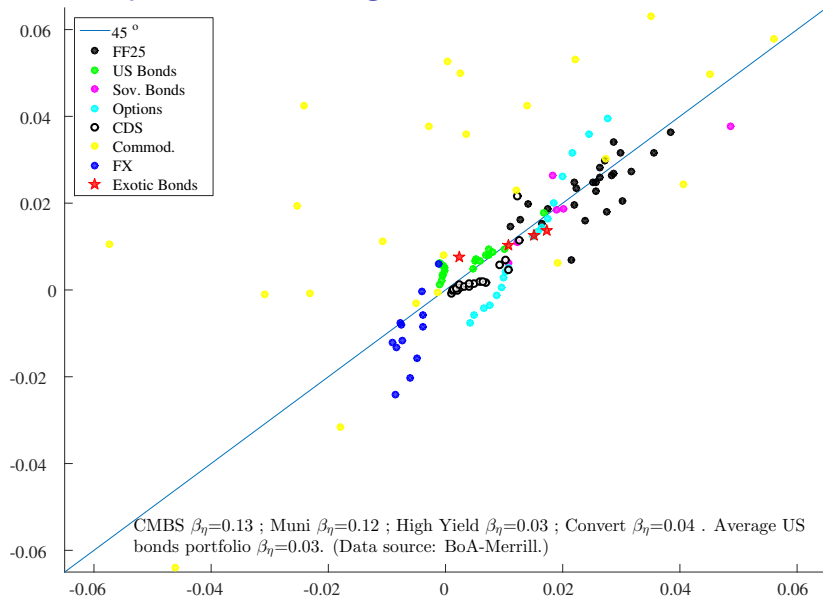
# Actual vs. predicted average excess returns



# Actual vs. predicted average excess returns



# Actual vs. predicted average excess returns



# Capital ratio vs. other pricing factors

Benchmark:	CAPM	FF3F	FF5F	Momentum	PS-liquidity	LMW
Capital	9.35 (2.52)	9.14 (1.98)	8.81 (2.46)	9.69 (2.84)	7.87 (1.75)	7.56 (1.76)
Market	1.49 (0.80)	1.62 (0.90)	1.33 (0.74)	1.54 (0.81)	1.21 (0.69)	
SMB		0.39 (0.42)	0.59 (0.68)			
HML		2.23 (1.36)	2.01 (1.46)			
CMA			-0.33 (-0.09)			
RMW			0.08 (0.04)			
MOM				-1.20 (-0.14)		
$PS^{nt}$					5.71 (0.64)	
$LMW^-$						0.77 (0.58)
LMW						0.63 (0.31)
Adj. $R^2$	0.71	0.80	0.69	0.73	0.67	0.70
MAPE, %	0.63	0.65	0.62	0.61	0.59	0.63
RRA	3.69	3.32	3.50	3.74	2.61	2.58
Assets	124	124	124	124	124	124
Quarters	172	172	172	172	172	172
Adj. $R^2$ w/o Capital	0.32	0.65	0.65	0.27	0.67	0.50
MAPE w/o Capital	0.85	0.86	0.82	0.85	0.83	0.87

## Conclusion

- ▶ Assets' exposure to changes in the capital ratio of primary dealers explain variation in expected excess returns across asset classes
  - ▶ equities, US bonds, foreign sovereign bonds, options, CDS, commodities, and currencies
- ▶ Findings lend empirical support to the view that financial intermediaries are price-setting investors in many asset classes
- ▶ Financial soundness of these intermediaries is important for understanding wide ranging asset price behavior