Financial Markets, Volatility and the Macroeconomy

or

Returns, Volatility and Fundamentals

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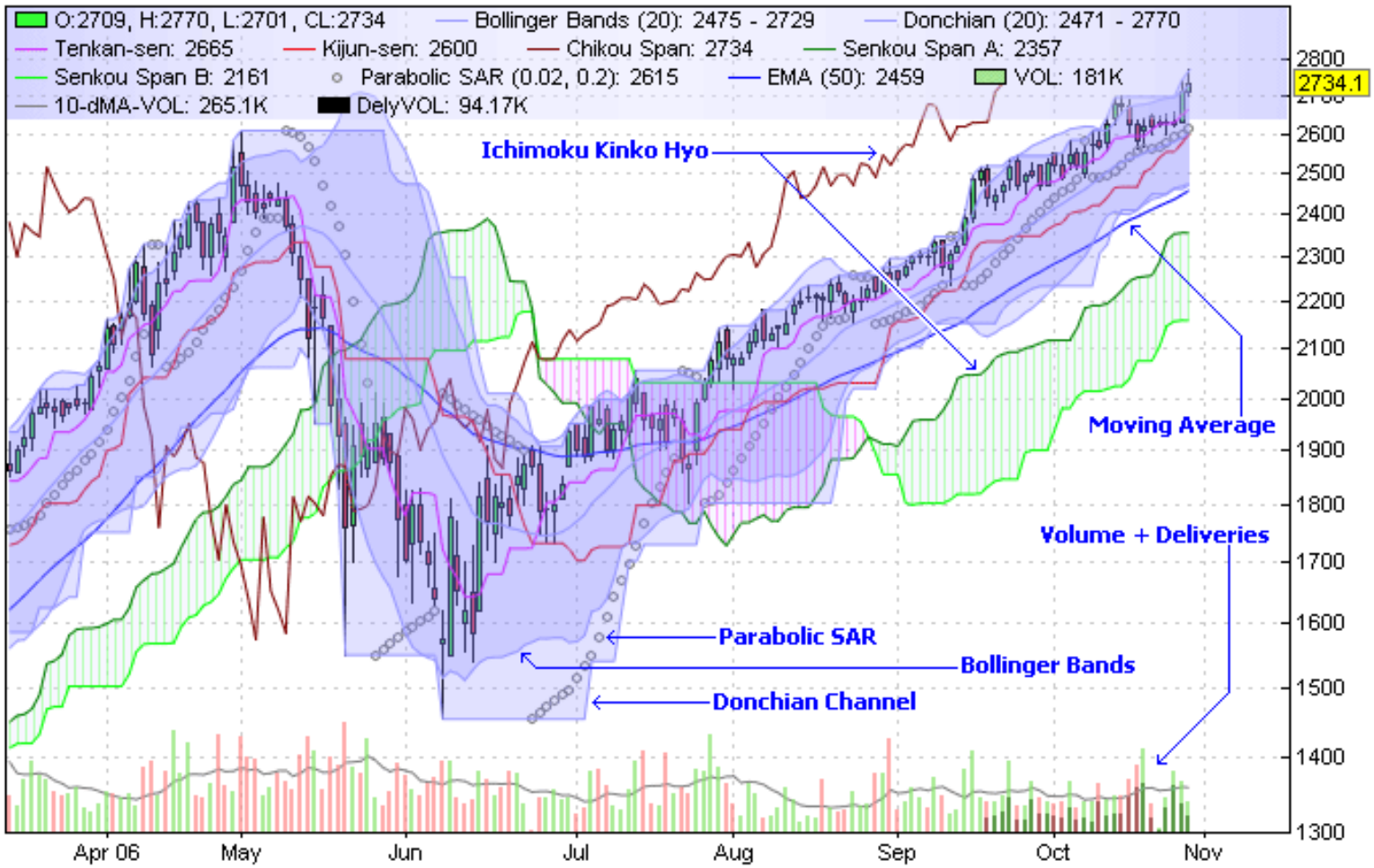
Returns


O:2709, H:2770, L:2701, CL:2734
Bollinger Bands (20): 2475 - 2729
Donchian (20): 2471 - 2770
Tenkan-sen: 2665
Kijun-sen: 2600
Chikou Span: 2734
Senkou Span A: 2357
Senkou Span B: 2161
Parabolic SAR (0.02, 0.2): 2615
EMA (50): 2459
VOL: 181K
10-dMA-VOL: 265.1K
DelyVOL: 94.17K
2734.1
Ichimoku Kinko Hyo
Moving Average
Volume + Deliveries
Parabolic SAR
Bollinger Bands
Donchian Channel
2800
2600
2500
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
Apr 06
May
Jun
Jul
Aug
Sep
Oct
Nov

Fundamentals

We Want to Understand the Financial / Real Connections

Statistical vs. "scientific" models

Returns $\leftrightarrow$ Fundamentals

$$r \leftrightarrow f$$

Disconnect?
"excess volatility," "disconnect," "conundrum," ...

$$\mu_r,\ \sigma_r,\ \sigma_f,\ \mu_f$$

Links are complex:
$$\mu_r \leftrightarrow \sigma_r \leftrightarrow \sigma_f \leftrightarrow \mu_f$$

Volatilities as intermediaries?

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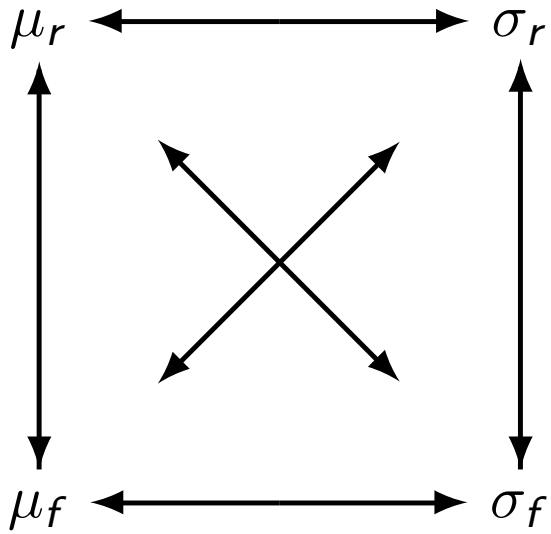
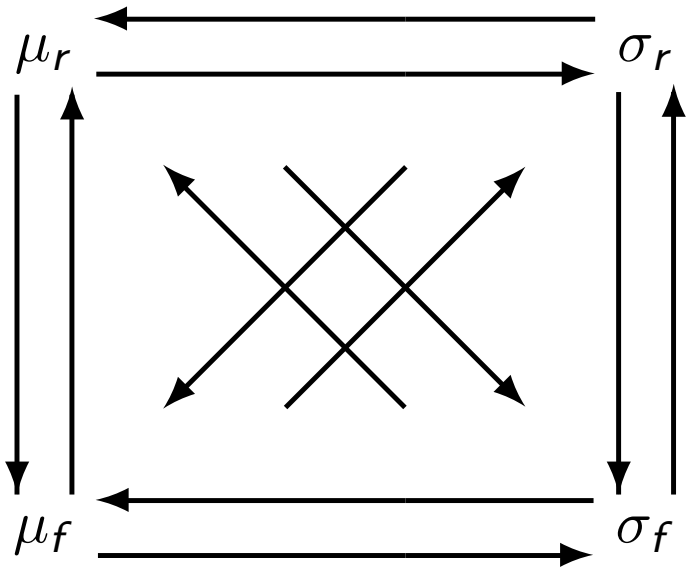
A More Complete Picture



(Perhaps Ultimately Also Explore Causal Paths)



This doubles the number of links to be addressed!
We won't pursue that here.

For Example...

GARCH σ_r usually has no μ_f or σ_f:

$$\sigma^2_{r,t} = \omega + \alpha r^2_{t-1} + \beta \sigma^2_{r,t-1}.$$

One might want to entertain something like:

$$\sigma^2_{r,t} = \omega + \alpha r^2_{t-1} + \beta \sigma^2_{r,t-1} + \delta_1 \mu_{f,t-1} + \delta_2 \sigma_{f,t-1}.$$

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$\mu_f \leftrightarrow \sigma_r$

Return Volatility is Higher in Recessions

Schwert's (1989) "failure": Very hard to link market risk to expected fundamentals (leverage, corporate profitability, etc.).

Actually a great success:
Key observation of robustly higher return volatility in recessions!

– Earlier: Officer (1973)
– Later: Hamilton and Lin (1996), Bloom et al. (2009)

Extends to business cycle effects in credit spreads via the Merton model

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$\mu_f \leftrightarrow \sigma_r$, Continued
Bloom et al. (2009) Results

	Mean Recession Volatility Increase	Standard Error	Sample Period
Aggregate Returns	43.5%	3.8%	63Q1-09Q3
Firm-Level Returns	28.6%	6.7%	69Q1-09Q2

Table: Stock Return Volatility During Recessions. Aggregate stock-return volatility is quarterly realized standard deviation based on daily return data. Firm-level stock-return volatility is the cross-sectional inter-quartile range of quarterly returns.

$\mu_f \leftrightarrow \sigma_f$

Fundamental Volatility is Higher in Recessions
More Bloom, Floetotto and Jaimovich (2009) Results

	Mean Recession Volatility Increase	Standard Error	Sample Period
Aggregate Growth	37.5%	7.3%	62Q1-09Q2
Firm-Level Growth	23.1%	3.5%	67Q1-08Q3

Table: Real Growth Volatility During Recessions. Aggregate real-growth volatility is quarterly conditional standard deviation. Firm-level real-growth volatility is the cross-sectional inter-quartile range of quarterly real sales growth.

$\sigma_f \leftrightarrow \sigma_r$

Return Vol is Positively Related to Fundamental Vol

Follows immediately from relationships already documented

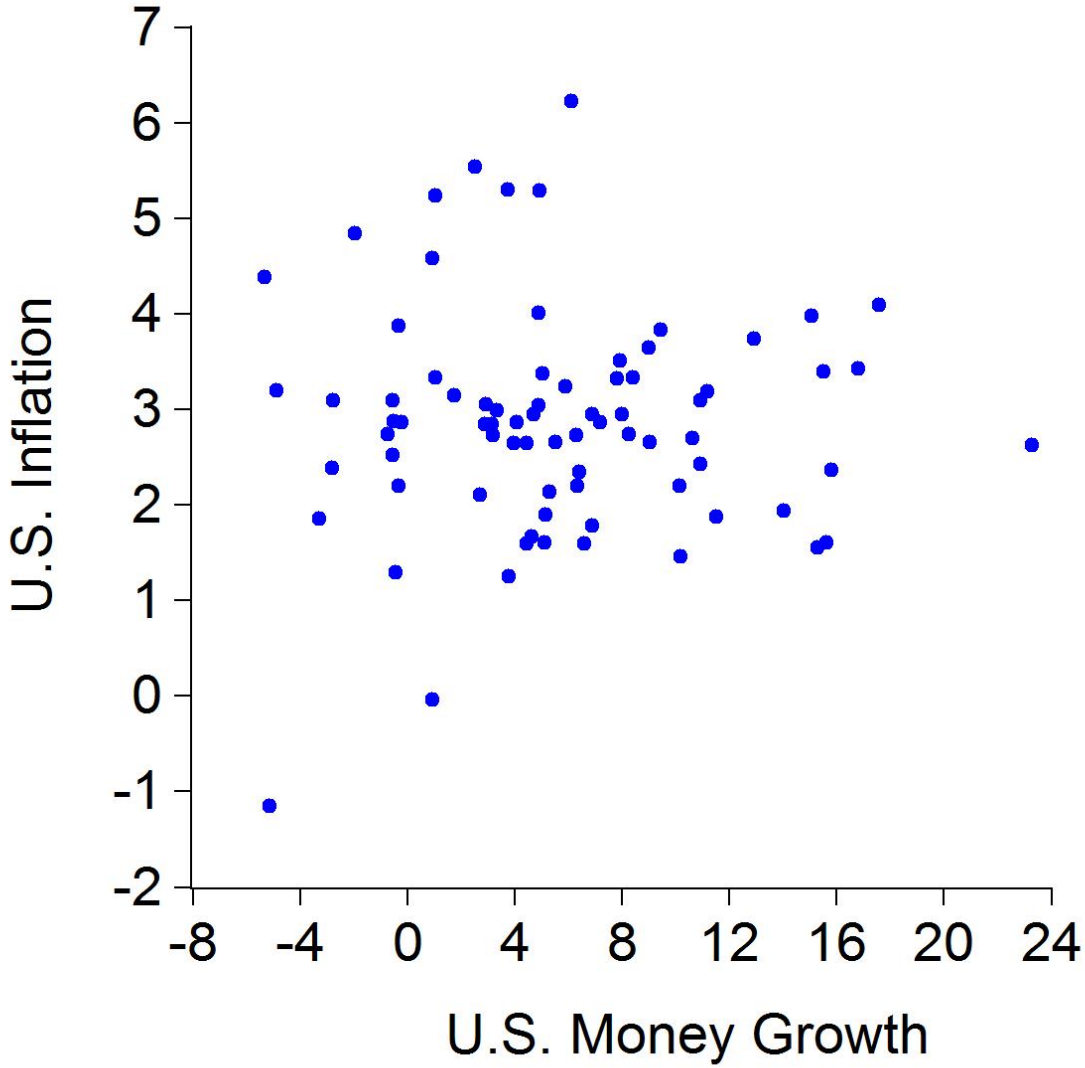
Moreover, direct explorations provide direct evidence:

– Engle et al. (2006) time series
– Diebold and Yilmaz (2010) cross section
– Engle and Rangel (2008) panel

Can be extended to fundamental determinants of correlations (Engle and Rangle, 2011)

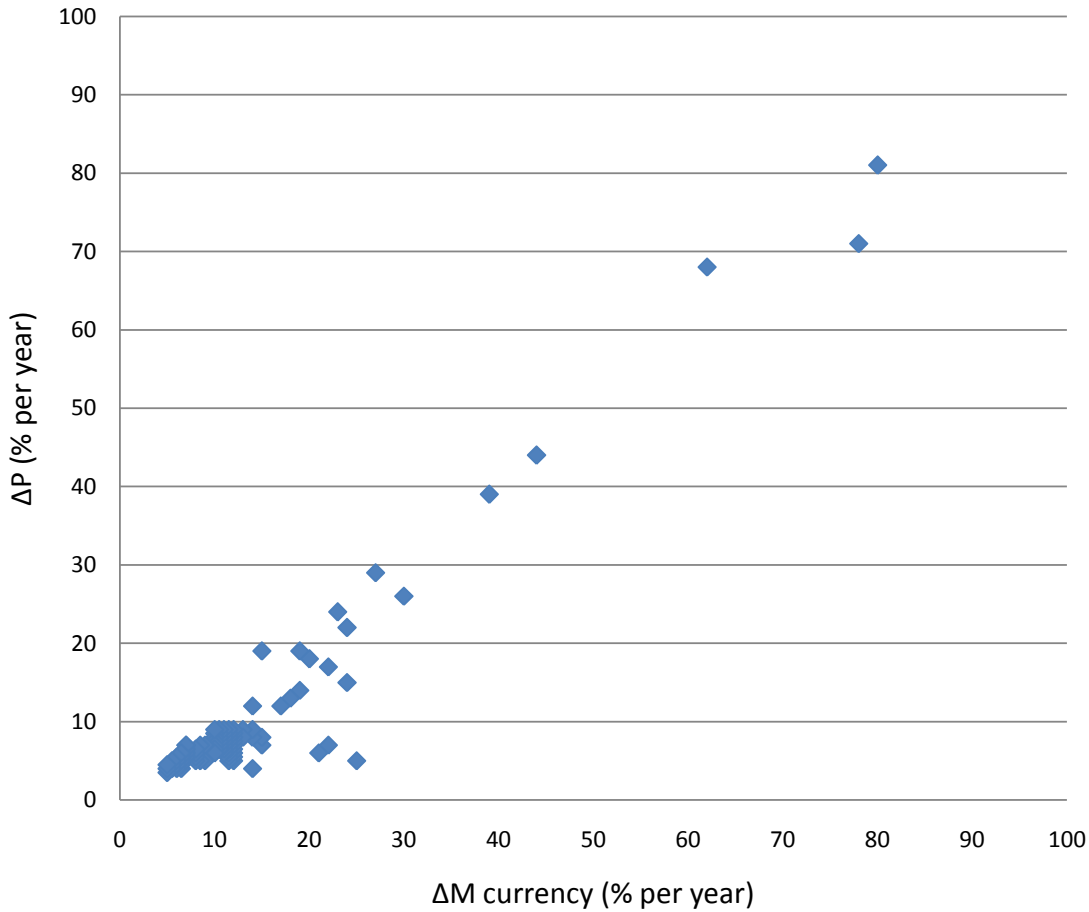
[Aside: Inflation and its Fundamental (U.S. Time Series)]

Weak inflation / money growth link



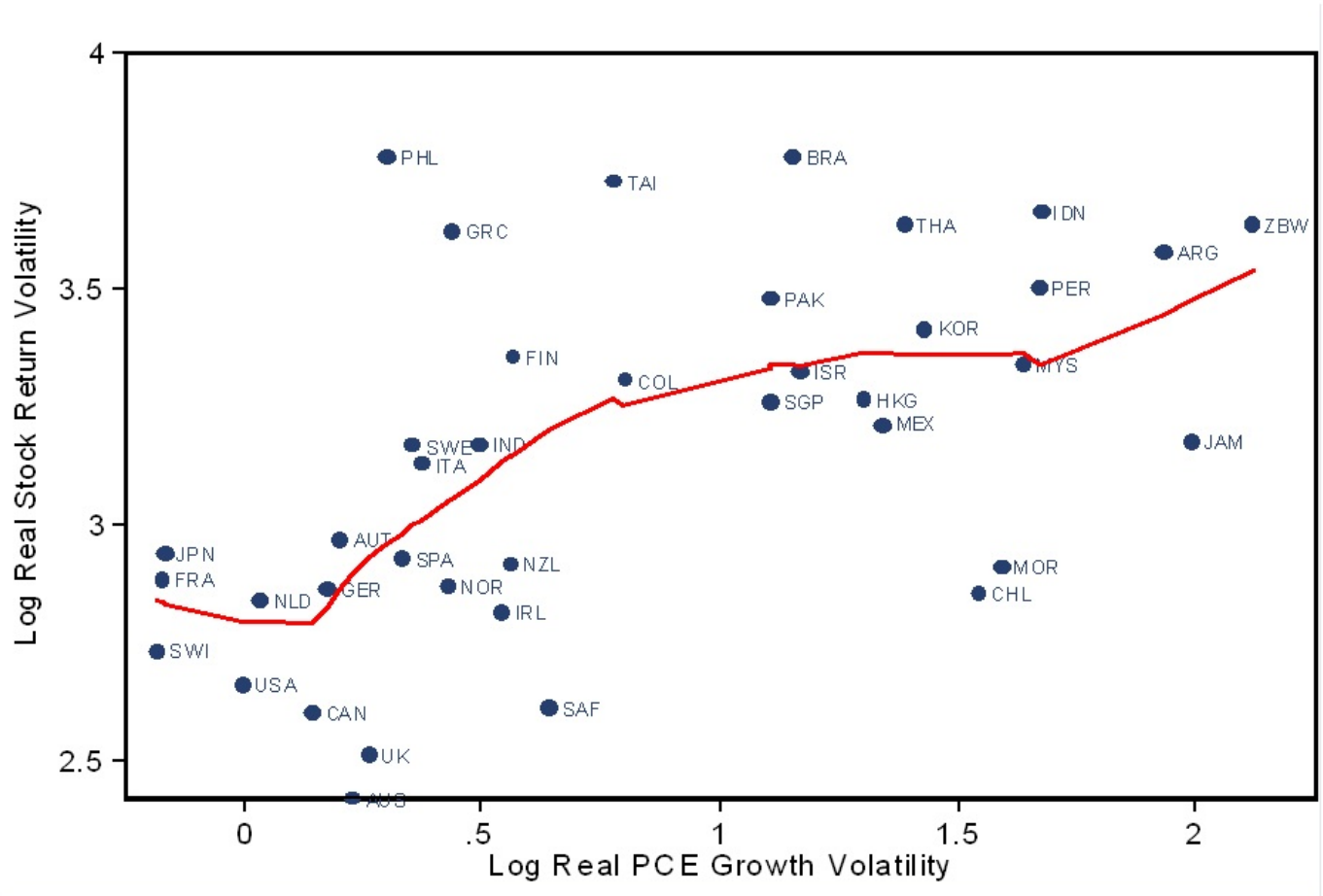
[Inflation and its Fundamental (Barro's Cross Section)]

Strong inflation / money growth link



Back to $\sigma_f \leftrightarrow \sigma_r$: Cross-Section Evidence

Real Stock Return Volatility and Real PCE Growth Volatility, 1983-2002



Now Consider Relationships Involving the Equity Premium

$$?? \ \mu_r \ ??$$

$\mu_r \leftrightarrow \sigma_r$
"Risk-Return Tradeoffs" (or Lack Thereof)

Studied at least since Markowitz

ARCH-M characterization:

$$R_t = \beta_0 + \beta_1 X_t + \beta_2 \sigma_t + \varepsilon_t$$

$$\sigma_t^2 = \omega + \alpha r_{t-1}^2 + \beta \sigma_{t-1}^2$$

– But subtleties emerge...

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$\mu_r \leftrightarrow \mu_f$

Odd Fama-French (1989):

$$r_{t+1} = \beta_0 + \beta_1 dp_t + \beta_2 term_t + \beta_3 def_t + \epsilon_{t+1}$$

Less Odd Lettau-Ludvigson (2001):

$$r_{t+1} = \beta_0 + \beta_1 dp_t + \beta_2 term_t + \beta_3 def_t + \beta_4 cay_t + \epsilon_{t+1}$$

Natural Campbell-Diebold (2009):

$$r_{t+1} = \beta_0 + \beta_1 dp_t + \beta_2 term_t + \beta_3 def_t + \beta_4 cay_t + \beta_5 g_t^e + \epsilon_{t+1}$$

– Also Goetzman et al. (2009) parallel cross-sectional analysis

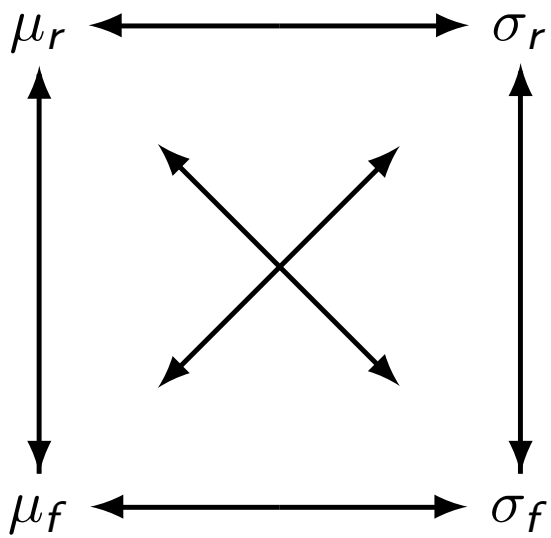
Expected Business Conditions are Crucially Important!

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
g_t^e	-0.22	–	–	-0.21	-0.20	–	-0.20
	(0.08)	–	–	(0.09)	(0.09)	–	(0.10)
DP_t	–	–	0.25	0.17	–	0.19	0.12
			(0.10)	(0.10)		(0.12)	(0.11)
DEF_t	–	–	-0.11	-0.01	–	-0.10	0.00
			(0.07)	(0.09)		(0.08)	(0.09)
$TERM_t$	–	–	0.15	0.17	–	0.09	0.11
			(0.07)	(0.07)		(0.09)	(0.09)
CAY_t	–	0.24	–	–	0.22	0.17	0.15
		(0.07)			(0.08)	(0.11)	(0.10)

$\mu_r \leftrightarrow \sigma_f$

Bansal and Yaron (2004)
(and many others recently)

So, Good News:
We are Learning More and More About the Links



We've Come a Long Way Since Markowitz:

$$\mu_r \leftrightarrow \sigma_r$$

The Key Lesson

The business cycle is of central importance for both μ_r and σ_r

– Highlights the importance of high-frequency business cycle monitoring. We need to interact high-frequency real activity with high-frequency financial market activity

e.g., Aruoba-Diebold-Scotti real-time framework at Federal Reserve Bank of Philadelphia

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