

International Stock Return Predictability: What is the Role of the United States?

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- **Stock return predictability**: central issue in finance
- Vast empirical literature using economic variables
 - **Significant predictable component** in US returns (Campbell, 2000; Cochrane, 2007; Lettau & Ludvigson, 2009)
- Source of predictability
 - Time-varying macroeconomic risk premiums (eg, Fama & French, 1989; Campbell & Cochrane, 1999)
 - Inefficiencies/information frictions (eg, Baker & Wurgler, 2000; Hong et al., 2007)
- Several important studies analyze return predictability **outside US** (eg, Harvey, 1991; Bekaert & Hodrick, 1992; Ang & Bekaert, 2007)
 - Limited number of countries/predictors
 - Short samples
 - In-sample tests

- We extensively analyze return predictability in US & 11 other industrialized countries
- We answer the following questions
 - Predictability economically significant outside US?
 - Similar variables predict returns in US & other countries?
 - Links among national markets?
 - **Special role for US?**
- Our approach
 - Monthly excess returns for 11 industrialized countries/US
 - Large number of potential predictors
 - Domestic economic variables (popular vars. from literature)
 - US variables (Harvey, 1991; Ferson & Harvey, 1993)
 - Lagged international returns (lead-lag relationships)
 - **Out-of-sample** tests
 - More reliable
 - In-sample results can be fragile (Goyal & Welch, 2008)

- **Predictive regression** model: $r_{i,t+1} = \alpha + \beta x_t + \epsilon_{i,t+1}$
 - $r_{i,t}$ = country i market index return minus risk-free rate
 - x_t = potential predictor
- Equity premium measured in **national currency**
 - \approx currency-hedged equity premium for investors from any country (interest rate parity)
 - Obviates need for exchange rate risk premium model
- Compute out-of-sample forecasts using **recursive** window
- Benchmark: **historical average** forecast
 - $\bar{r}_{i,t+1} = \sum_{j=1}^t r_{i,j}$
 - Random walk/constant expected excess return model
 - Stringent benchmark (Goyal & Welch, 2008)

- **Combination** forecasts
 - Simple average of individual forecasts
 - Outperforms complicated schemes (Timmermann, 2006)
 - Improve US equity premium forecasts (RSZ, 2009)
- Campbell & Thompson (2008) R_{OS}^2 statistic
 - Reduction in MSPE for individual/combination forecast relative to historical average forecast
 - Assess statistical significance using Clark & West (2007)
- R_{OS}^2 typically small for monthly excess returns
 - Nevertheless, small can be **economically significant** (Kandel & Stambaugh, 1996; Xu, 2004; Campbell & Thompson, 2008)
 - E.g., 0.5% for monthly US equity premium (Campbell & Thompson, 2008)

- Monthly data, 1956:02–2009:05
- Primarily from Global Financial Data
- Predictors
 - 10 domestic economic variables (listed below)
 - US economic variables
 - Lagged international excess returns
- 1966:01–2009:05 forecast evaluation period
 - Covers important global events
 - Oil shocks
 - Bull market of 80s/90s
 - EMU
 - 2000 market collapse
 - Recent crisis
 - Covers important country-specific events
 - German reunification
 - Japan's "lost decade"

Summary statistics

Monthly excess returns (%), 1956:02–2009:05

Country	Mean	SD	Min.	Max.	Sharpe	ρ
AUS	0.52	4.96	-43.05	18.40	0.11	0.09
BEL	0.22	4.45	-31.76	23.53	0.05	0.15
CAN	0.32	4.54	-23.30	15.95	0.07	0.12
FRA	0.40	5.48	-22.48	22.27	0.07	0.15
DEU	0.40	5.08	-24.09	19.84	0.08	0.15
ITA	0.21	6.48	-20.66	28.78	0.03	0.10
JPN	0.50	5.33	-26.67	27.45	0.09	0.06
NLD	0.49	5.07	-22.74	21.99	0.10	0.10
SWE	0.67	5.67	-22.61	33.89	0.12	0.13
CHE	0.62	4.84	-24.64	22.58	0.13	0.11
GBR	0.48	5.46	-27.33	53.16	0.09	0.12
USA	0.41	4.27	-22.09	16.30	0.10	0.06

OOS predictability: domestic economic variables

R^2_{OS} statistics (%), monthly excess returns, 1966:01–2009:05

Predictor	AUS	BEL	CAN	FRA	DEU	ITA
DP-OWN	-0.88	-0.72	-1.26	-0.44	-0.35	-0.85
INFL-OWN	-0.78	0.50*	-0.40	-0.44	-0.17	-0.40
dINFL-OWN	-0.91	-0.30	-0.26	-0.04	-0.30	0.05
BILL-OWN	-1.42	-0.80	-0.75	-0.69	0.33**	-1.36
BOND-OWN	-1.96	-0.90	-0.80	-1.18	-0.36	-1.20
LTR-OWN	-1.88	1.79***	0.10*	0.47*	-0.21	-0.98
TERM-OWN	-0.64	-0.72	-0.25	-0.11	0.10*	-0.55
OIL-OWN	-1.73	-0.18	-0.88	-1.05	-0.49	0.42**
IPG-OWN	-0.96	-0.42	0.51*	-0.78	-0.41	-0.61
RXR-OWN	-1.76	-0.95	-0.21	-2.27	-1.07	-2.89
ECON-OWN	0.03	0.42*	0.38	0.09	0.71**	0.36

Conclusion: little predictability, except for BEL & DEU

OOS predictability: domestic economic variables

R^2_{OS} statistics (%), monthly excess returns, 1966:01–2009:05

Predictor	JPN	NLD	SWE	CHE	GBR	USA
DP-OWN	-0.30	-0.64	-0.64	-1.10	0.43**	-0.88
INFL-OWN	0.05	-0.08	-0.44	-0.23	-1.05	-0.42
dINFL-OWN	0.14	-0.24	-0.36	-0.50	-0.19	-0.19
BILL-OWN	-0.38	-0.46	-0.82	-1.54	-1.99	-1.13
BOND-OWN	-1.15	-1.01	-0.74	-2.31	-3.20	-1.30
LTR-OWN	0.03	0.52	-0.03	-0.67	-0.61	1.05***
TERM-OWN	-0.70	-0.08	-0.33	-2.27	-1.54	-0.24
OIL-OWN	-1.45	-1.45	-1.23	-0.99	-0.39	-1.35
IPG-OWN	-0.09	-0.71	-0.64	-1.33	-1.17	-0.45
RXR-OWN	-0.55	-1.32	-0.63	-1.44	-5.07	-0.67
ECON-OWN	0.20	0.20	-0.03	-0.37	0.43	1.26*

Conclusion: significant predictability for US using combination forecast

OOS predictability: US economic variables

R^2_{OS} statistics (%), monthly excess returns, 1966:01–2009:05

Predictor	AUS	BEL	CAN	FRA	DEU	ITA
DP-USA	-0.96	-0.86	-1.15	-1.14	-0.70	-0.87
INFL-USA	-0.32	0.46*	-0.24	-0.27	0.28*	-0.12
dINFL-USA	0.12	-0.23	-0.17	0.19	0.44*	1.42***
BILL-USA	-0.72	-0.70	-0.90	-0.82	-0.61	-0.96
BOND-USA	-0.98	-0.73	-1.10	-0.93	-0.65	-1.16
LTR-USA	0.28*	1.00**	1.00***	-0.38	0.05	-0.40
TERM-USA	-0.71	-0.09	-0.80	-0.58	-0.97	-0.48
IPG-USA	-0.24	-0.39	-0.28	-0.35	-0.15	0.10
ECON-USA	0.26	0.62**	0.73**	-0.18	0.42**	0.10
ECON-OWN-USA	0.21	0.56**	0.58**	0.00	0.62**	0.30

Conclusion: US economic variables help somewhat for BEL, CAN, & DEU

OOS predictability: US economic variables

R^2_{OS} statistics (%), monthly excess returns, 1966:01–2009:05

Predictor	JPN	NLD	SWE	CHE	GBR
DP-USA	-0.46	-0.81	-0.64	-1.14	-1.12
INFL-USA	0.37**	0.14	-0.44	-0.48	-0.66
dINFL-USA	0.52*	-0.03	-0.36	-0.06	-0.02
BILL-USA	-0.76	-0.94	-0.82	-1.52	-1.01
BOND-USA	-1.02	-1.00	-0.74	-0.95	-1.28
LTR-USA	-1.74	0.12*	-0.03	0.22*	-0.95
TERM-USA	-0.53	-0.43	-0.33	-1.43	-0.21
IPG-USA	0.33	-0.18	-0.64	-0.45	-1.22
ECON-USA	0.22	0.44*	-0.17	0.37	0.10
ECON-OWN-USA	0.26*	0.35	-0.07	0.01	0.35

Conclusion: US economic variables help somewhat for NLD

OOS predictability: lagged international excess returns

R^2_{OS} statistics (%), monthly excess returns, 1966:01–2009:05

Predictor	AUS	BEL	CAN	FRA	DEU	ITA
LRET-AUS	0.06*	-0.29	0.01	0.08*	-1.05	0.29**
LRET-BEL	0.62**	1.93***	-0.07	2.00***	0.96**	0.23
LRET-CAN	1.09**	0.92**	0.86**	0.16	1.80***	0.38*
LRET-FRA	2.05***	0.99**	-0.26	0.94***	0.93**	1.65***
LRET-DEU	0.56**	0.33	0.13	0.36	-1.22	0.26*
LRET-ITA	0.35*	-0.01	0.02	0.19*	-0.07	0.43*
LRET-JPN	0.07	0.12	0.42*	0.60*	0.77**	-0.02
LRET-NLD	1.58***	1.90***	0.68**	1.32***	0.63***	0.10
LRET-SWE	0.83**	2.55***	2.10***	2.93***	1.93***	0.66***
LRET-CHE	1.51***	2.35***	0.40*	1.42***	2.77***	1.51***
LRET-GBR	1.08**	0.91***	0.40*	-0.28	0.43*	0.60**
LRET-USA	1.88***	2.96***	1.60***	1.39***	3.07***	1.74***
LRET-ALL	1.97***	2.10***	0.93***	2.16***	2.89***	1.31***
ALL	1.18***	1.34***	0.78***	1.11***	1.91***	0.86***

Conclusion: strong predictability using lagged international excess returns, especially LRET-USA

OOS predictability: lagged international excess returns

R^2_{OS} statistics (%), monthly excess returns, 1966:01–2009:05

Predictor	JPN	NLD	SWE	CHE	GBR	USA
LRET-AUS	1.29***	0.63**	-0.43	-0.24	-0.46	-0.48
LRET-BEL	1.40**	0.48	0.43*	-0.67	-0.56	-0.92
LRET-CAN	1.98***	0.78**	1.60***	0.66**	-0.62	-0.43
LRET-FRA	1.02**	0.37	0.29	-0.44	0.27*	-1.36
LRET-DEU	0.06	-0.04	0.48*	0.42*	-0.14	-0.62
LRET-ITA	0.85**	0.02	0.34	-0.27	-0.85	-0.32
LRET-JPN	-0.09	1.00***	0.39*	-0.03	0.01	-0.41
LRET-NLD	0.63*	0.45*	0.81**	0.57*	0.02*	-0.40
LRET-SWE	1.24**	1.86***	1.07**	3.64***	-0.31	0.19
LRET-CHE	0.21	1.49***	0.90**	0.82**	0.70*	-0.45
LRET-GBR	2.53***	0.75**	0.70**	0.82**	0.49	-0.02
LRET-USA	2.09***	1.87***	2.32***	2.33***	-0.23	-0.40
LRET-ALL	1.84***	1.26***	1.15**	1.63***	0.50	-0.28
ALL	1.03***	0.82***	0.53**	0.80**	0.55	0.50**

Conclusion: apart from GBR & USA, strong predictability using lagged international excess returns, especially LRET-USA

Summary of out-of-sample results

- Sharp **difference** in nature of out-of-sample predictability
 - In the US: **economic variables** in combination are significant equity premium predictors & clearly outperform lagged international excess returns
 - Other countries: lagged international excess returns—especially **lagged US returns**—substantially outperform economic variables
- US plays a **leading role**
 - US returns \rightarrow future non-US returns
 - Non-US returns $\not\rightarrow$ future US returns

Information frictions

- Lead-lag patterns in international returns reminiscent of cross-serial correlation in US domestic market
 - Lo & MacKinlay (1990): big stocks lead small stocks
 - Brennan et al. (1993): stocks with greater analyst coverage lead stocks with less coverage
 - Chordia & Swaminathan (2000): high-volume stocks lead low-volume stocks
- Potential explanation: **information frictions** (eg, Hong et al., 2007)
 - Many investors specialize in market segments
 - Information-processing limitations
 - Shocks in certain segments thus reach others with a lag
- International context
 - Many investors specialize in US market
 - US economic shocks important for other countries

Spurious lead-lag relationships?

- Market microstructure/thin trading (Lo & MacKinlay, 1990; Boudoukh et al., 1994)
 - Monthly returns
 - Industrialized countries with active markets
- Autocorrelation & contemporaneous correlation (Boudoukh et al., 1994; Hameed, 1997)
 - **Granger causality** tests (Brennan et al., 1993; Hameed, 1997; Chordia & Swaminathan, 2000)
 - International context
 - ARDL model: $r_{i,t+1} = a_0 + b_0 r_{i,t} + c_0 r_{j,t} + e_{i,t+1}$
 - $c_0 \neq 0 \Rightarrow$ country j returns Granger cause country i returns
 - Presence of $r_{i,t}$ controls for autocorrelation
 - We perform in-sample & out-of-sample tests

Granger causality tests

In-sample & out-of-sample test results, monthly excess returns

US return \rightarrow non-US return ($r_{i,t}$ = non-US return, $r_{j,t}$ = US return)				Non-US return \rightarrow US return ($r_{i,t}$ = US return, $r_{j,t}$ = non-US return)			
Country	\hat{b}_0	\hat{c}_0	R_{OS}^2 (%)	Country	\hat{b}_0	\hat{c}_0	R_{OS}^2 (%)
AUS	0.03	0.16***	1.08**	AUS	0.03	0.02	-0.55
BEL	0.07	0.16***	0.81***	BEL	0.07	0.01	-1.14
CAN	0.01	0.15**	0.11	CAN	0.01	0.00	-0.58
FRA	0.09*	0.14**	0.03	FRA	0.09*	-0.01	-1.45
DEU	0.07	0.20***	1.72***	DEU	0.07	-0.02	-0.65
ITA	0.06	0.18***	1.05***	ITA	0.06	0.02	-0.54
JPN	0.02	0.17***	1.68***	JPN	0.02	0.02	-0.40
NLD	-0.01	0.20***	1.09***	NLD	-0.01	0.00	-0.48
SWE	0.07	0.18***	1.03**	SWE	0.07	0.06*	-0.27
CHE	0.01	0.19***	1.20***	CHE	0.01	-0.02	-0.56
GBR	0.09	0.06	-1.03	GBR	0.09	0.05	-0.40

Summary of Granger causality test results

- US returns Granger cause non-US returns
 - Lagged US returns remain significant after controlling for autocorrelation
- Non-US returns do not Granger cause US returns
- **Leading role** for US
- Coeff. estimates ($\hat{c}_0 > 0$) \Rightarrow non-US returns **underreact**
 - Consistent with information friction story

Business-cycle fluctuations

- Investigate predictability over classical business-cycle phases (expansion/recession)
 - Classical cycle corresponds to NBER approach
- We find greater predictability during recessions
 - Differences in US & non-US return predictability magnified during recessions
- Links predictability to real economy
 - Recessions are periods of rapidly changing macroeconomic fundamentals

OOS predictability: expansions

R^2_{OS} statistics (%), monthly excess returns

Country	Obs.	ECON-OWN	ECON-USA	ECON-OWN/USA	LRET-USA	LRET-ALL	ALL
AUS	85%	0.23	0.41	0.39	1.23***	1.12***	0.91***
BEL	82%	0.24	0.56**	0.43**	1.26***	1.42***	0.98***
CAN	88%	0.19	0.55*	0.40	0.00	0.23	0.40*
FRA	82%	0.35	0.00	0.23	0.93**	2.07***	1.19***
DEU	71%	0.87**	0.50**	0.75**	1.72**	2.67***	1.87***
ITA	81%	0.50*	0.20	0.43*	0.36*	0.63*	0.67**
JPN	79%	0.04*	0.17	0.16	0.24	0.75*	0.51*
NLD	75%	0.48	0.75**	0.63**	0.03	0.29	0.59**
SWE	75%	-0.31	-0.13	-0.20	1.74**	0.71*	0.29
CHE	74%	0.00	0.57*	0.32	1.08**	0.98**	0.72***
GBR	87%	1.46***	1.23**	1.45***	1.23**	0.35	1.17***
USA	84%	0.53*	—	—	-0.34	-0.47	0.06
Avg.	80%	0.38	0.44	0.45	0.79	0.90	0.78

OOS predictability: recessions

R_{OS}^2 statistics (%), monthly excess returns

Country	Obs.	ECON-OWN	ECON-USA	ECON-OWN/USA	LRET-USA	LRET-ALL	ALL
AUS	15%	-0.73	-0.32	-0.48	4.41**	5.31**	2.23
BEL	18%	0.93*	0.76	0.89	7.64***	3.96**	2.34**
CAN	12%	1.12	1.42*	1.29*	7.99***	3.69***	2.33***
FRA	18%	-0.65	-0.70	-0.66	2.70*	2.41*	0.88
DEU	29%	0.45	0.27	0.42	5.30***	3.24**	1.98***
ITA	19%	0.07	-0.12	0.03	4.67***	2.75***	1.27**
JPN	21%	0.57*	0.33	0.51	6.33***	4.31***	2.22***
NLD	25%	-0.37	-0.21	-0.27	5.78***	3.32***	1.31*
SWE	25%	0.42	-0.25	0.14	3.23**	1.85**	0.90**
CHE	26%	-1.12	-0.03	-0.60	4.83***	2.94***	0.97
GBR	13%	-1.49	-2.02	-1.69	-2.97	0.78	-0.60
USA	16%	2.79***	-	-	-0.69	0.11	1.42**
Avg.	20%	0.16	-0.08	-0.04	4.10	2.89	1.44

Recent global crisis

- Final exercise: consider 2007:01–2009:05 forecast evaluation period covering **recent global crisis**
- Global crisis especially informative period
 - Rapidly changing macroeconomic/financial conditions
 - Originated primarily in US
- Particularly interested in information frictions
 - Leading role for US during crisis?
- Lagged US returns are very useful for forecasting non-US returns during crisis

OOS predictability: recent global crisis

R^2_{OS} statistics (%), monthly excess returns, 2007:01–2009:05

Country	ECON-OWN	ECON-USA	ECON-OWN/USA	LRET-USA	LRET-ALL	ALL
AUS	-0.54	-2.24	-1.27	10.87**	7.33*	2.55*
BEL	0.68	-0.50	0.16	11.39**	6.34**	2.81**
CAN	-0.11	-1.75	-0.82	11.01**	6.01**	2.05*
FRA	-0.47	-0.70	-0.56	13.34***	9.25***	3.67**
DEU	-0.22	-0.77	-0.45	12.17**	7.29**	2.96**
ITA	-0.03	-0.14	-0.05	13.52***	7.46***	3.16**
JPN	0.06	-0.32	-0.08	10.55***	7.03**	2.99**
NLD	0.69*	-0.21	0.30	10.32***	5.57**	2.55**
SWE	-1.29	-0.08	-0.75	6.71*	3.94*	1.35
CHE	-1.62	-2.30	-1.90	13.33**	6.81**	1.89*
GBR	1.30	-0.80	0.39	6.85**	3.85*	1.99**
USA	-1.79	—	—	0.22	1.51*	0.06
Avg.	-0.28	-0.89	-0.46	10.02	6.03	2.34

Conclusion

- We analyze return predictability for 11 industrialized countries/US
 - Potential predictors: domestic & U.S. economic variables, lagged international returns
 - Out-of-sample tests
- Nature of predictability differs in US & non-US countries
 - Predictive power for economic variables in US, less so in other countries
 - US returns **lead** non-US returns
- Our findings consistent with **information frictions**
 - Many investors focus on US
 - Information reaches other equity markets with a lag
 - Of course, cannot rule out equilibrium time-varying risk story