Stock Market Returns of the PSEI

An Econometric Analysis

Aries Eroles

UA&P

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Section 1

Introduction

Subsection 1

Background

Background

A market in which prices always "fully reflect" available information is called "efficient."

- Eugene F. Fama (1970)

Section 2

Statement of the Problem

Subsection 1

Motivation

Motivation

- Relevant to investing public
- Macroeconomic indicators seem to be good candidates in predicting future prices of financial assets
- Fitting macro perspective to micro question

Subsection 2

Research questions

Research questions

- Which macroeconomic variables can be able to determine the market returns of the Philippine Stock Exchange (PSE) Index? Which ones do not?
- Which of the variables have a positive relationship to PSEI market returns? Which ones have a negative relationship?
- What is the degree of the relationship of the variables with significant explanatory power?

Section 3

Model definition

Subsection 1

Review of related literature

Fama (1970 and 1981)

- A market in which prices always "fully reflect" available information is called "efficient."
  - *Weak form* - historical prices
  - *Semi-strong* - pices efficiently adjust to other information that is obviously publicly available
  - *Strong form*
- Positive : 1) capital expenditure; 2) rate of return of capital; and 3) output
- Negative : 4) inflation and 5) real activity in the context of money

Summary of previous work

- Fama (1981) - US stock market real returns
  - Capital expenditures (+);
  - Average real rate of return on capital (+);
  - Output (+)
  - Inflation (-);
  - Real activity related to money (-)
- Murcia (2014) - PSEI
  - Philippine Peso - US Dollar exchange rate (PHP = 1 USD) (-);
  - Gold reserves (-);
  - Consumer Price Index (CPI) (-)

Summary of previous work (Cont.)

- Endres (2020) - PSEI
  - *In the short run:* PHP = 1 USD (-); Interest rate (i) (+)
  - In the long run: PHP = 1 USD (+)
- Sajor, Ulla, and Pizarro-Uy (2023) - PSEI
  - In the short run:
    - $\Delta \log FDI$) (+)
    - $\Delta \log FDI_{t-1}$ (+)
    - log of real exchange rate (+)
    - Δi_{t-3} (-)

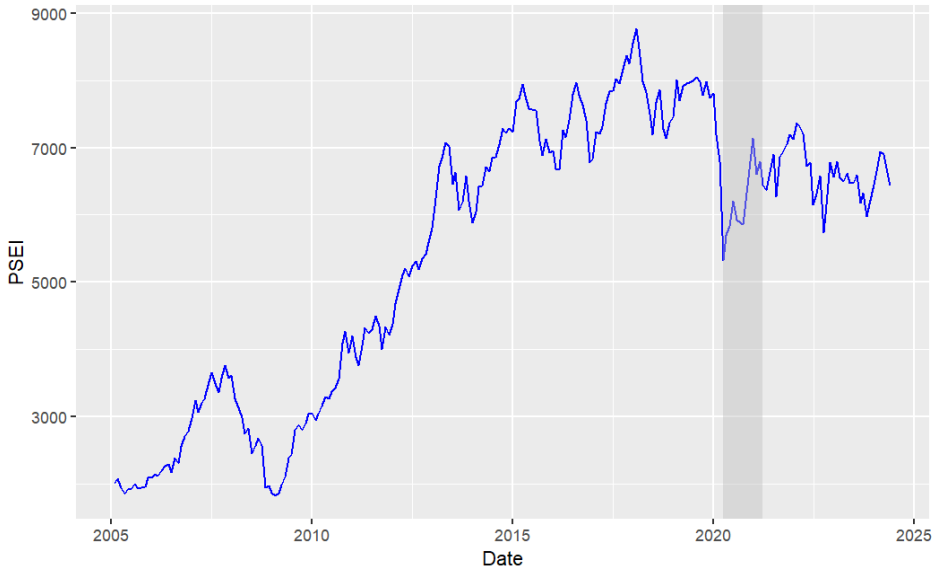
Summary of previous work (Cont.)

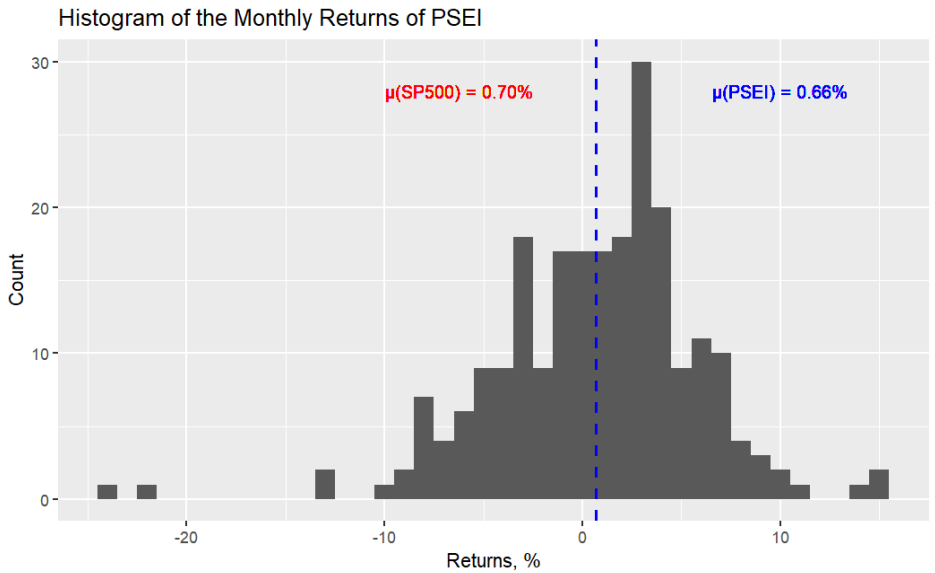
- Sajor, Ulla, and Pizarro-Uy (2023) (Cont.) - PSEI
- In the long run:
  - *RER* (+)
  - *i* (-)
  - log *FDI* (-)

Subsection 2

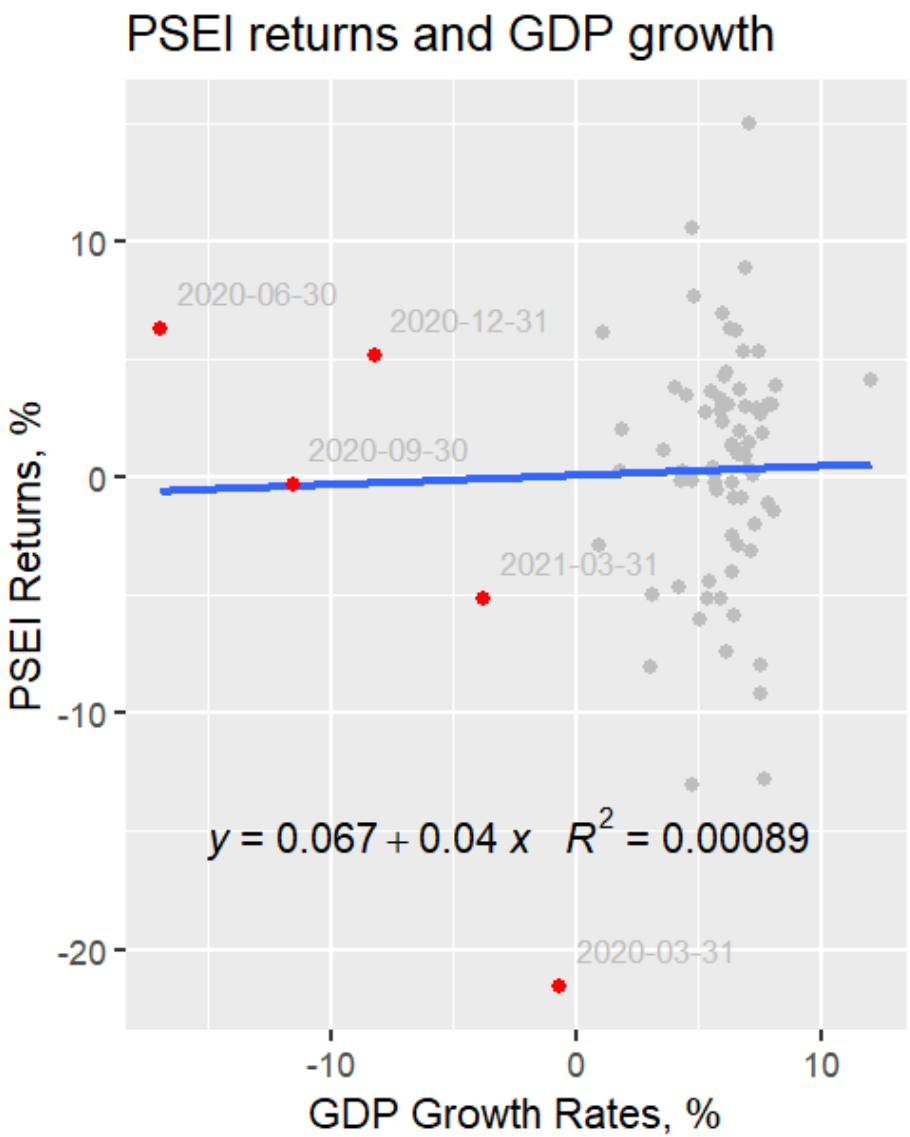
Explanatory Variables

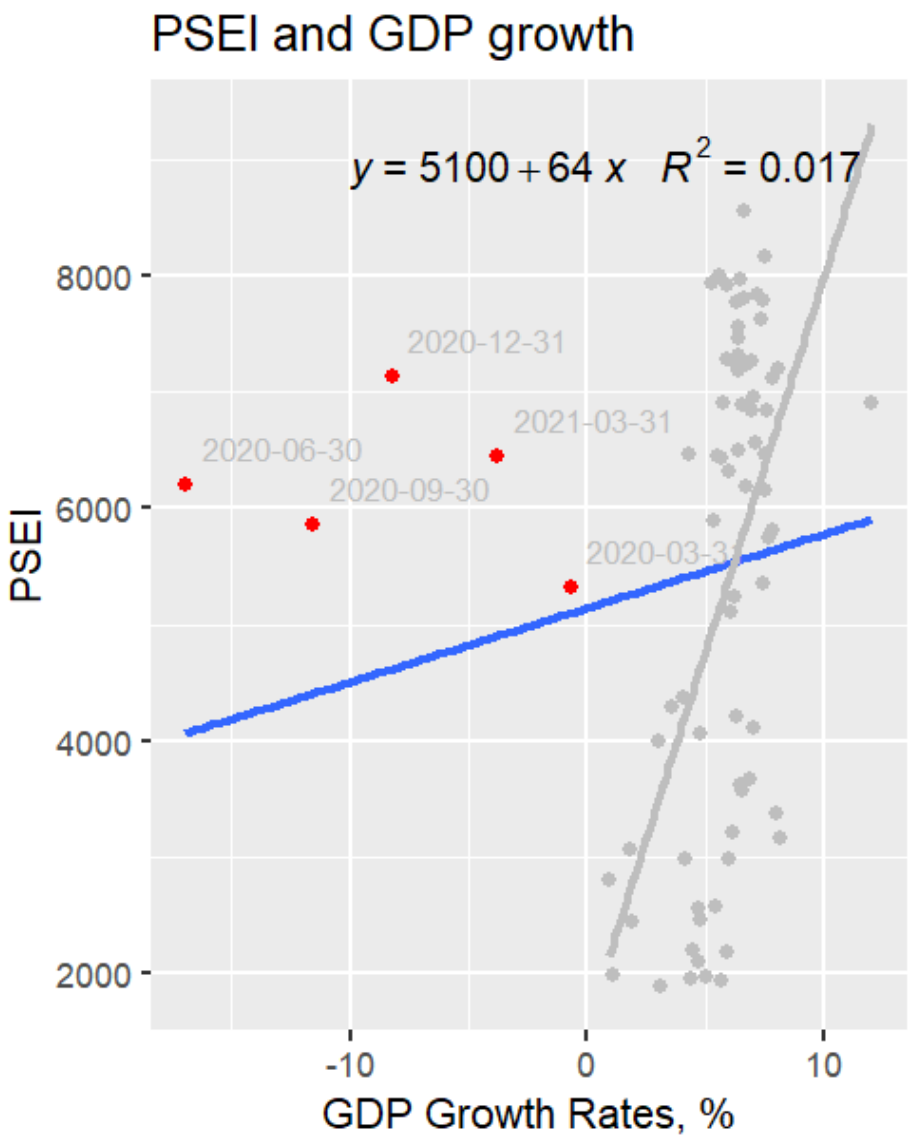
PSEI


9000
7000
5000
3000
PSEI
2005
2010
2015
2020
2025
Date

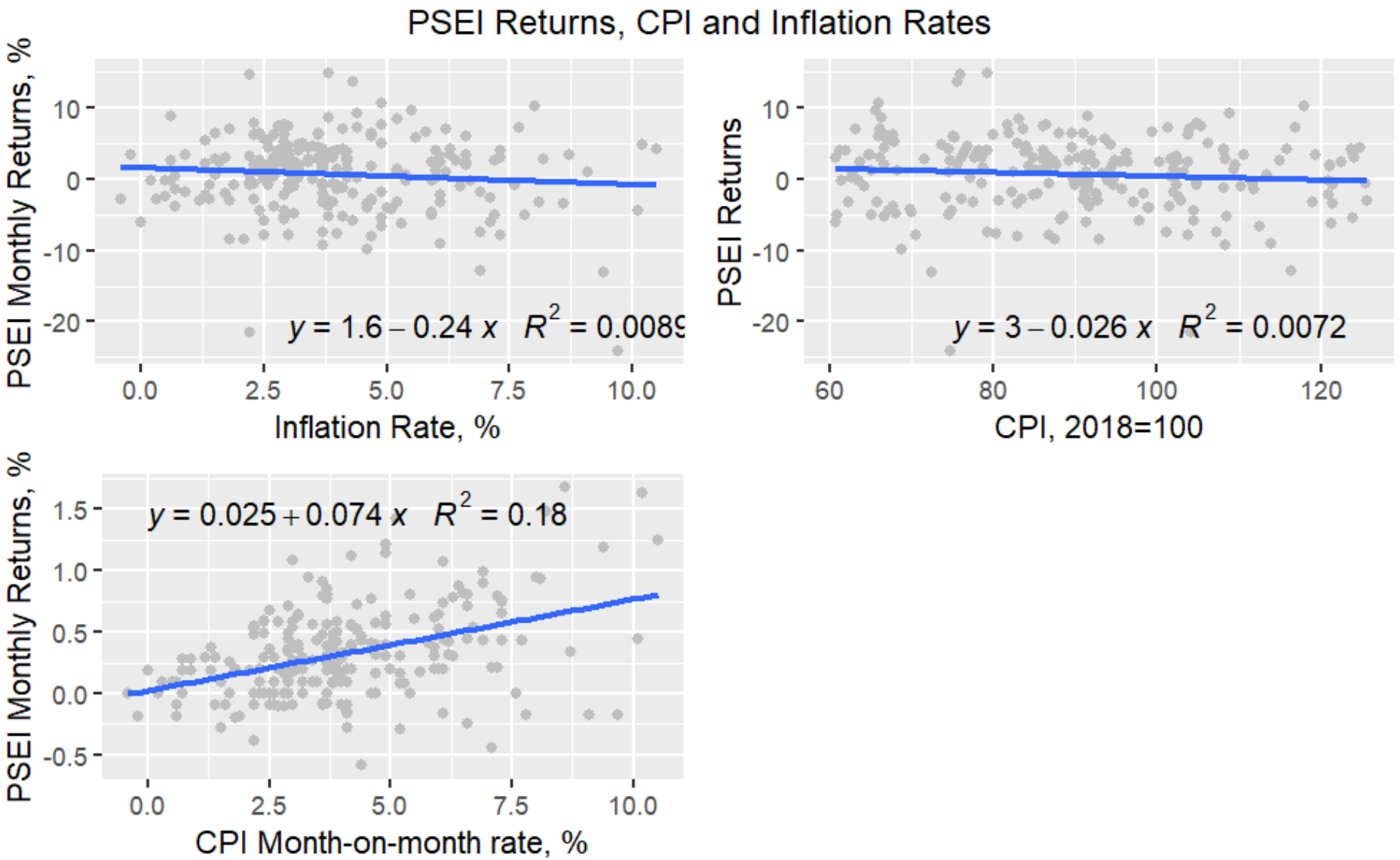

Histogram of the Monthly Returns of PSEI
μ(SP500) = 0.70%
μ(PSEI) = 0.66%
30
20
10
0
Count
-20
-10
0
10
Returns, %

GDP Growth

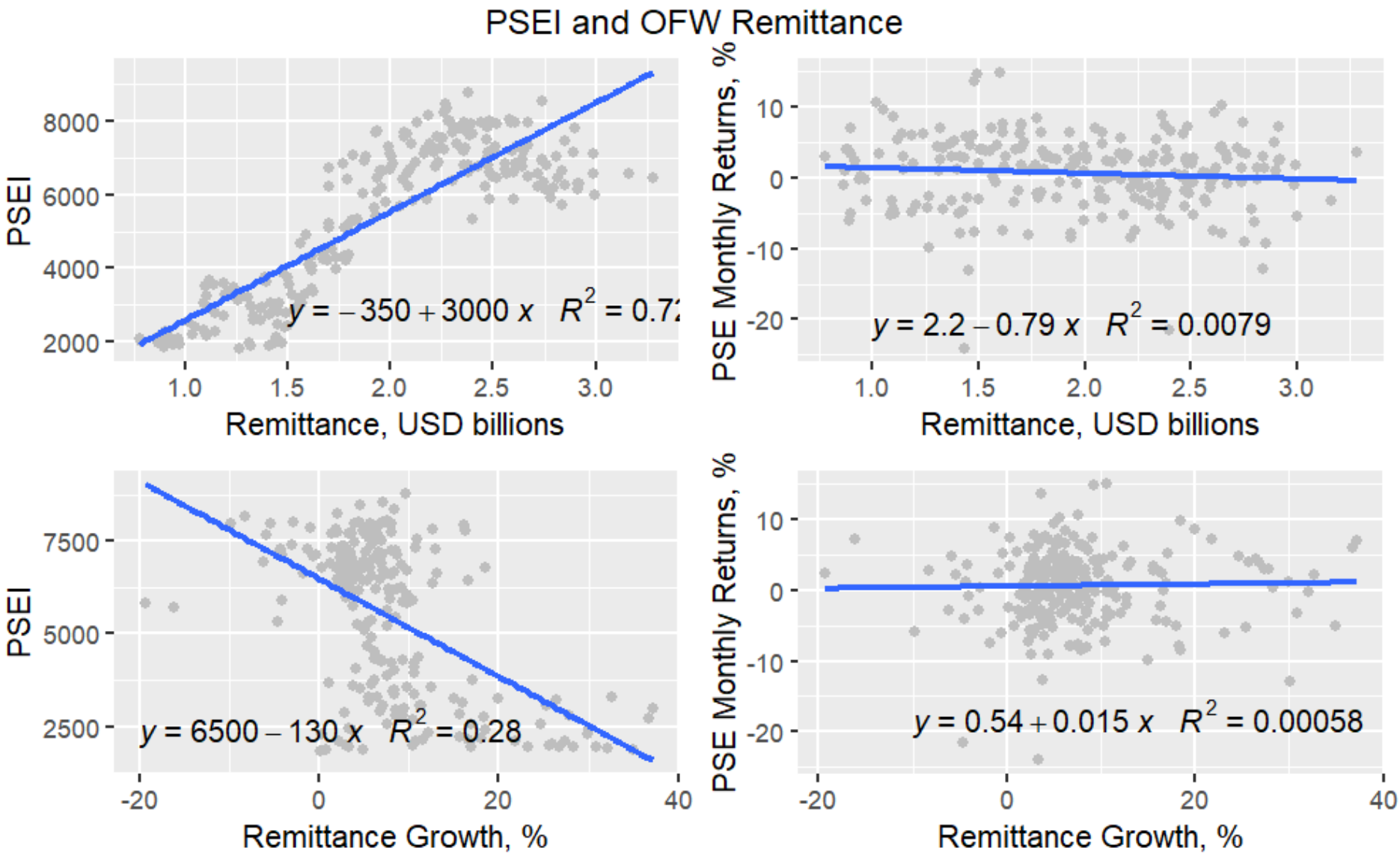

PSEI returns and GDP growth
PSEI Returns, %
GDP Growth Rates, %
2020-06-30
2020-12-31
2020-09-30
2021-03-31
2020-03-31
y = 0.067 + 0.04 x R² = 0.00089
10
0
-10
-20
-10
0
10


PSEI and GDP growth
PSEI
GDP Growth Rates, %
y = 5100 + 64 x R² = 0.017
2020-12-31
2021-03-31
2020-06-30
2020-09-30
2020-03-31
8000
6000
4000
2000
-10
0
10

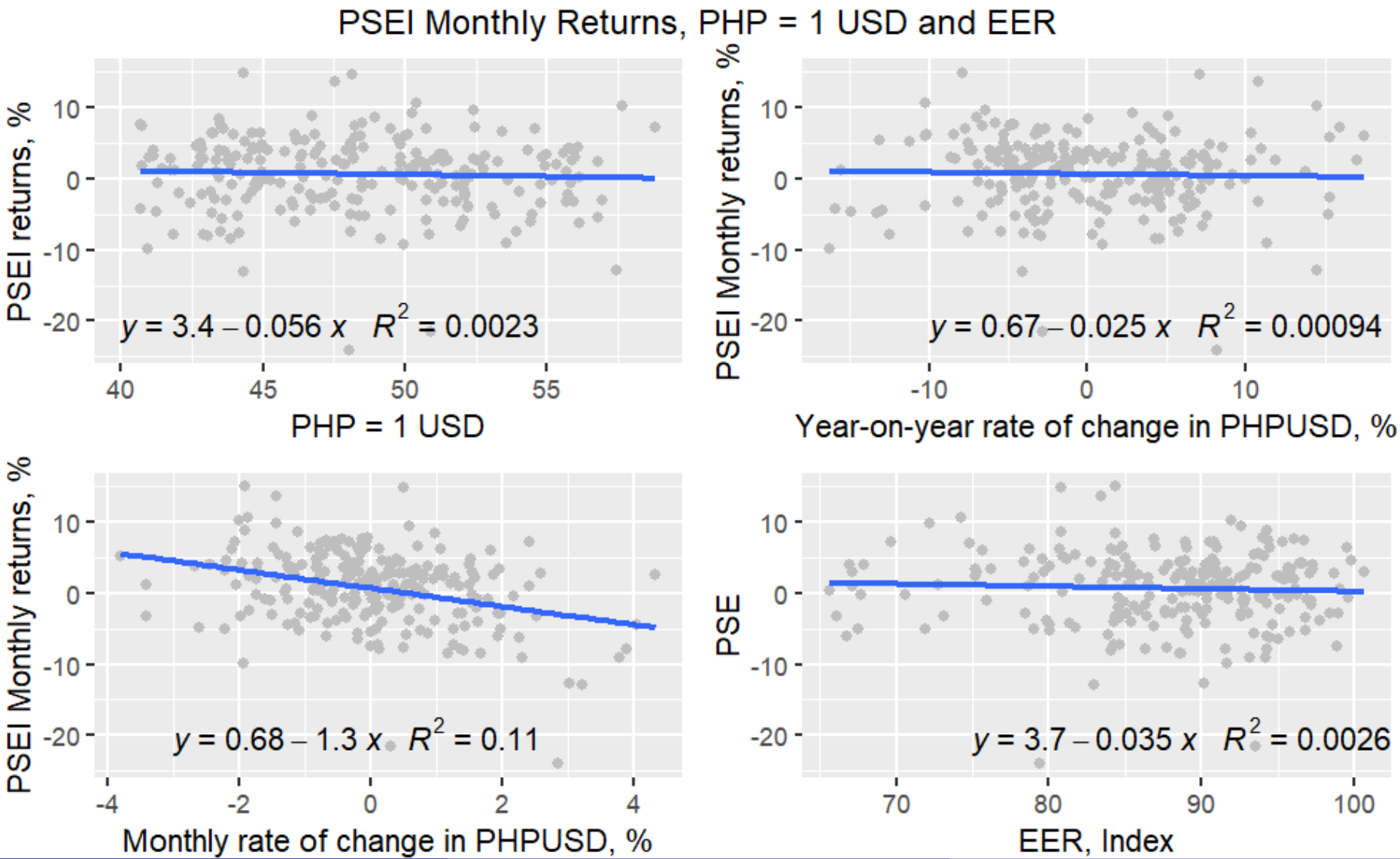
CPI and Inflation Rate



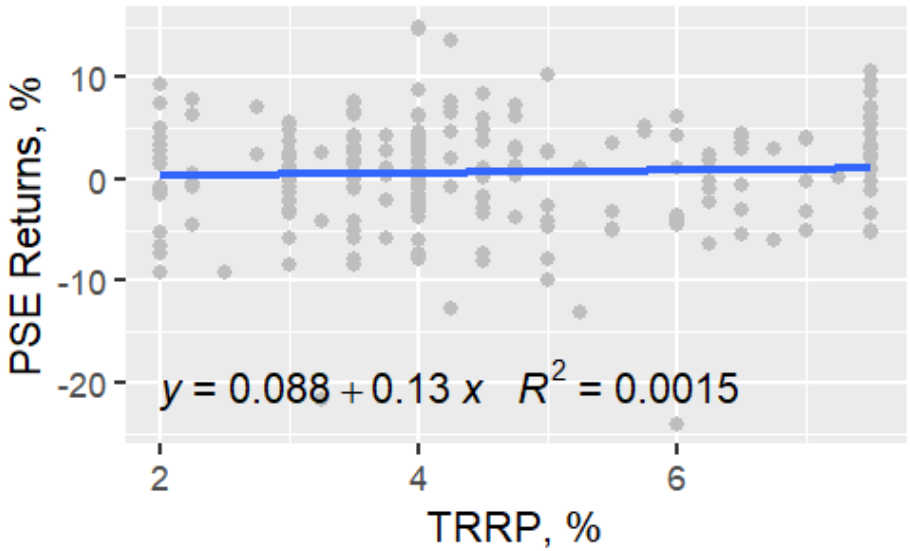
OFW Remittance

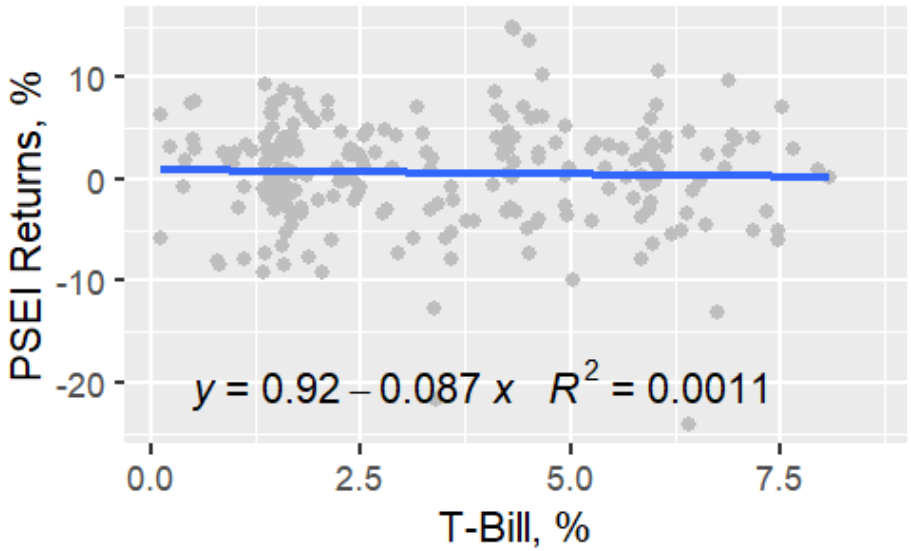


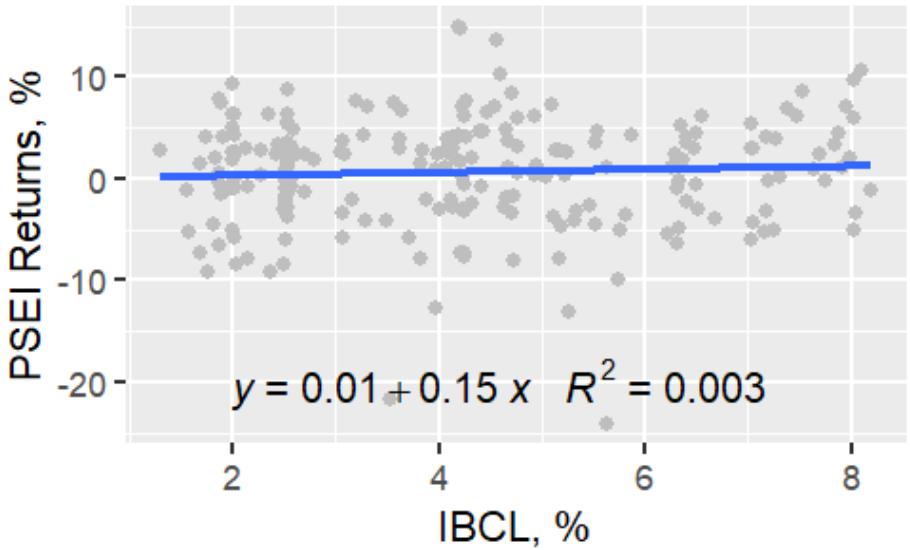
PHP = 1 USD and EER



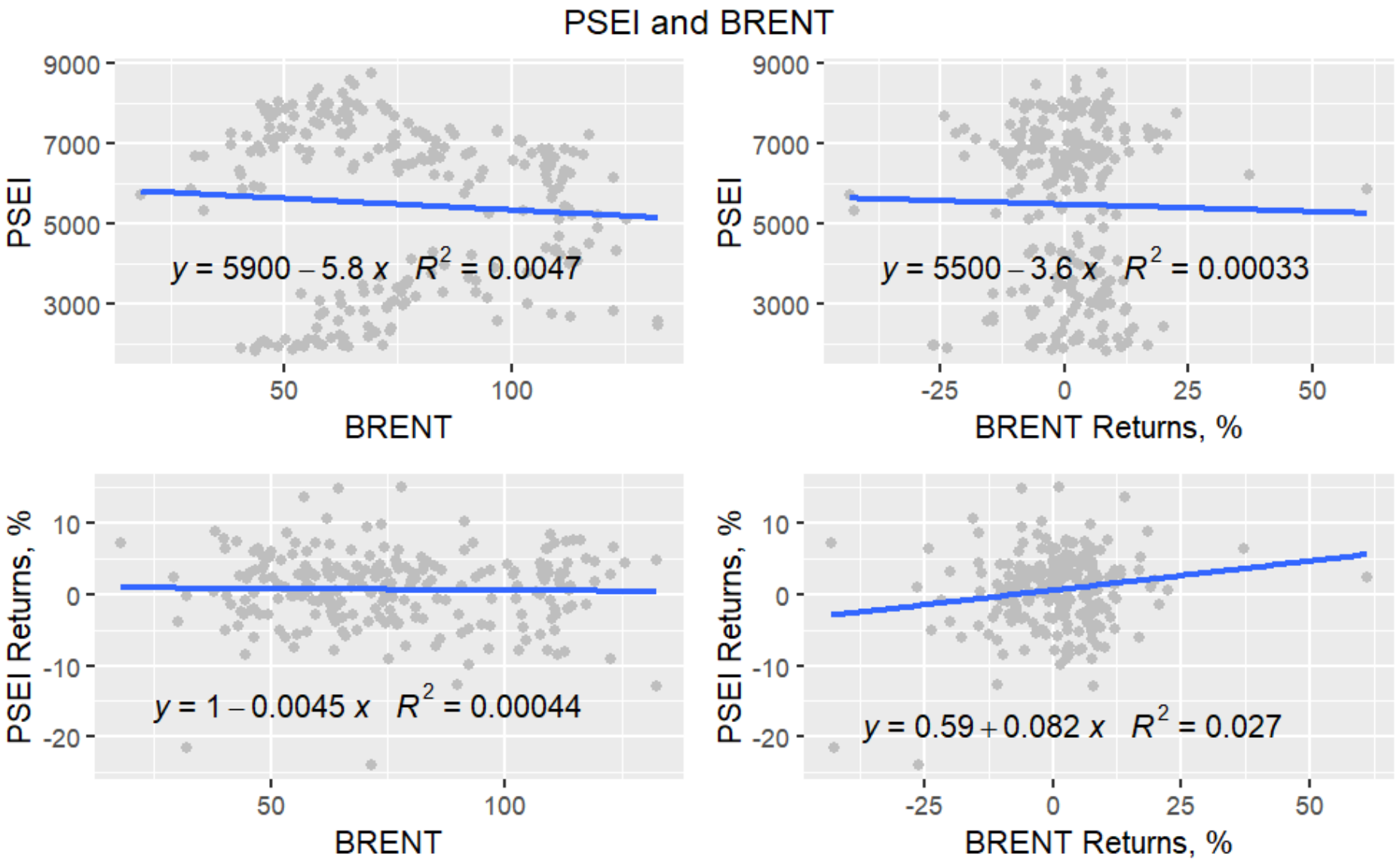
Domestic interest rates



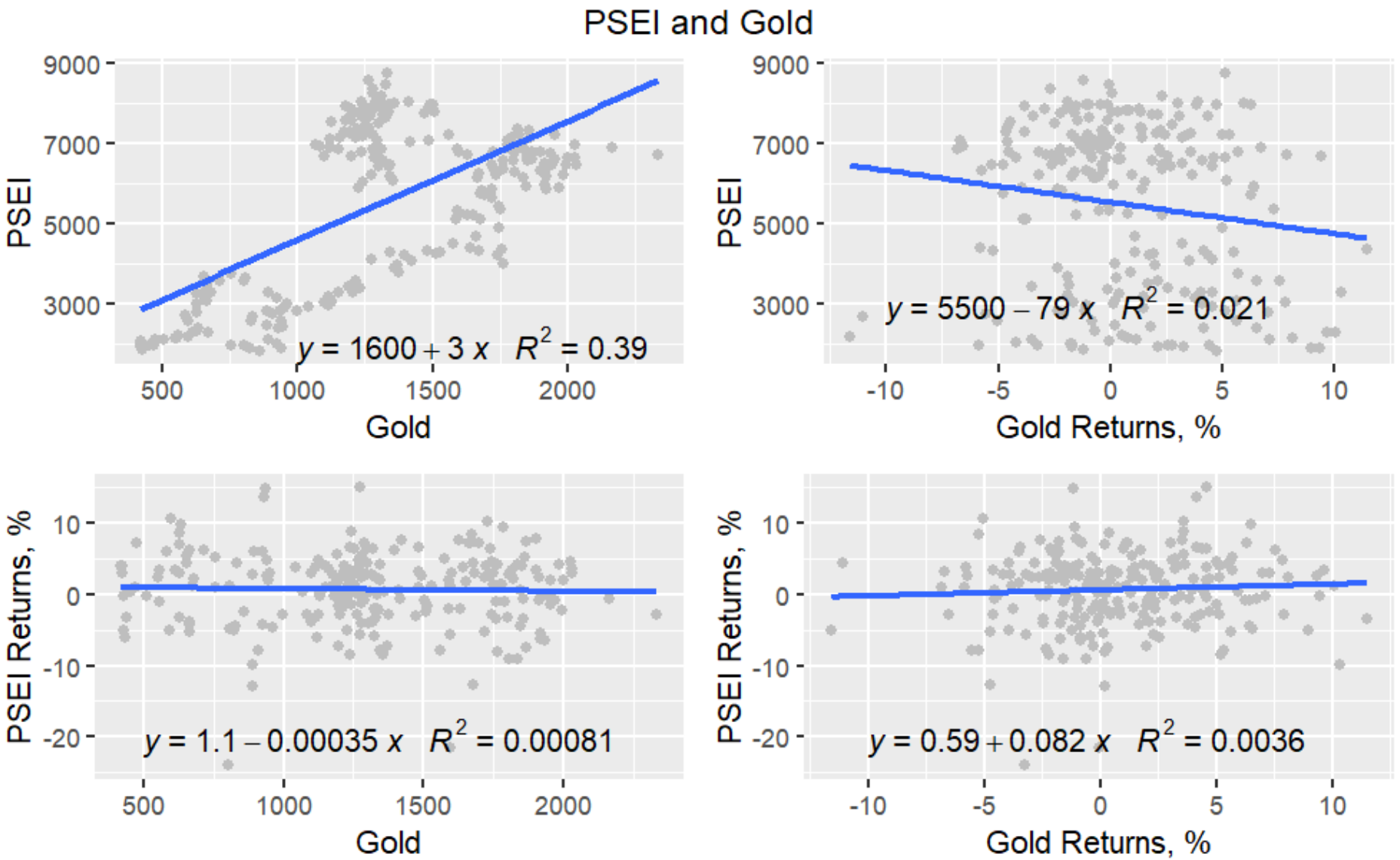




BRENT

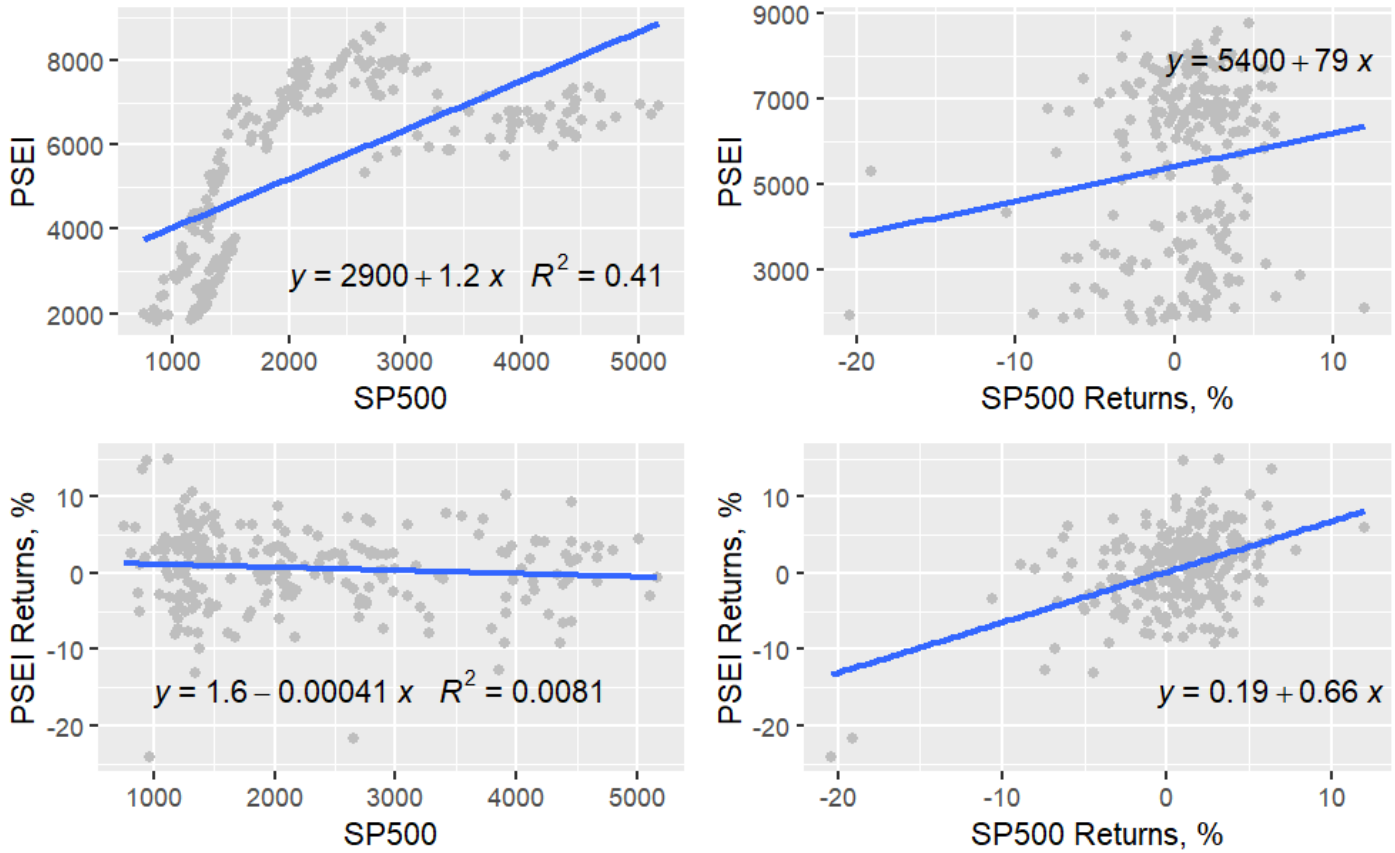

PSEI and BRENT
PSEI
BRENT
y = 5900 – 5.8 x R² = 0.0047
BRENT Returns, %
y = 5500 – 3.6 x R² = 0.00033
PSEI Returns, %
y = 1 – 0.0045 x R² = 0.00044
y = 0.59 + 0.082 x R² = 0.027

Gold

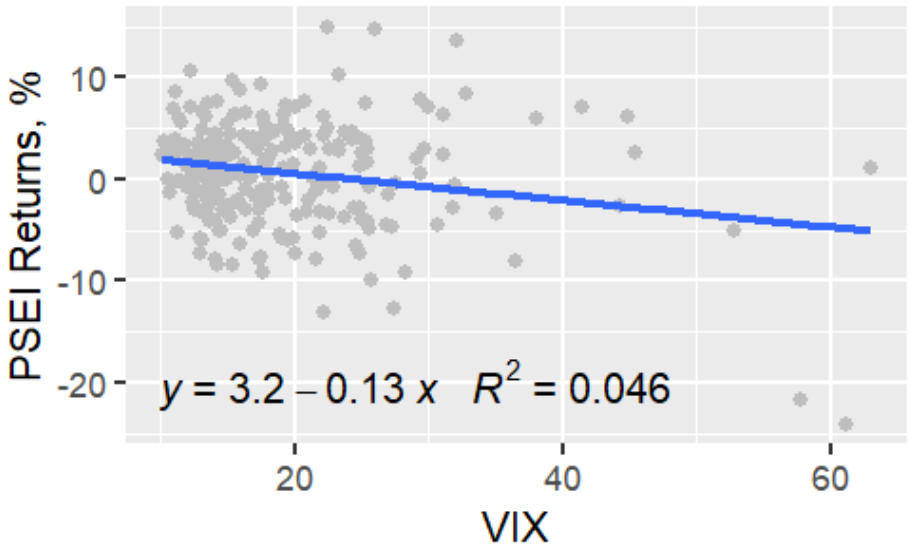

PSEI and Gold
PSEI
Gold
y = 1600 + 3 x R² = 0.39
Gold Returns, %
y = 5500 – 79 x R² = 0.021
PSEI Returns, %
y = 1.1 – 0.00035 x R² = 0.00081
y = 0.59 + 0.082 x R² = 0.0036

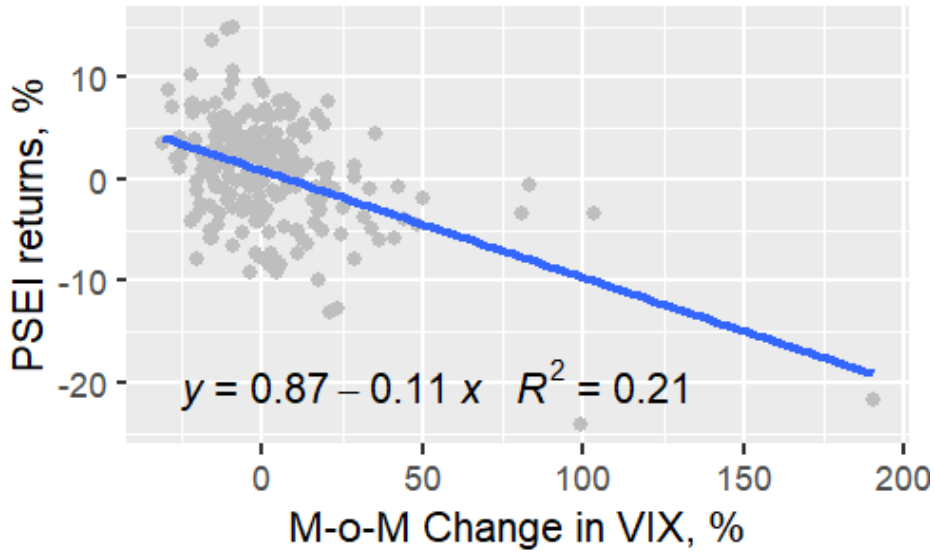
S&P 500

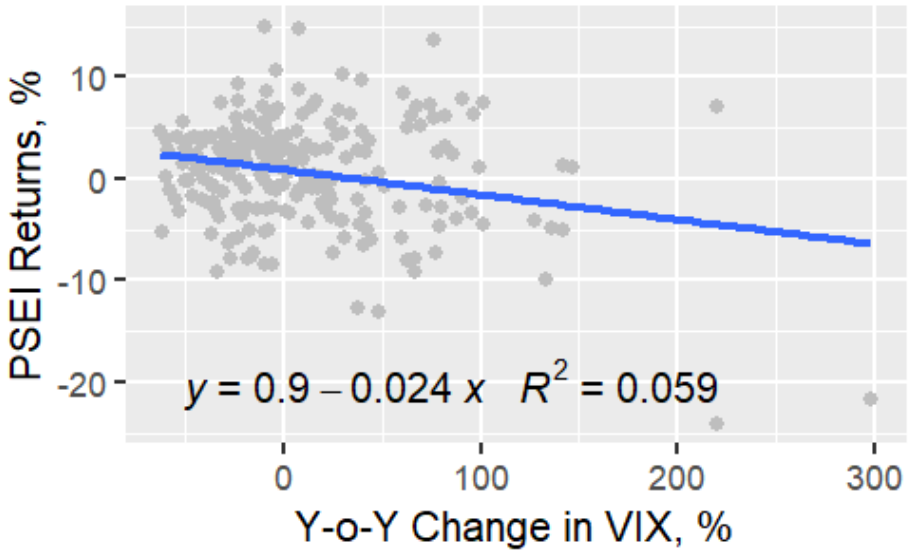
- "Stocks climb on positive data, Wall Street's rise" (Ochave 2024)

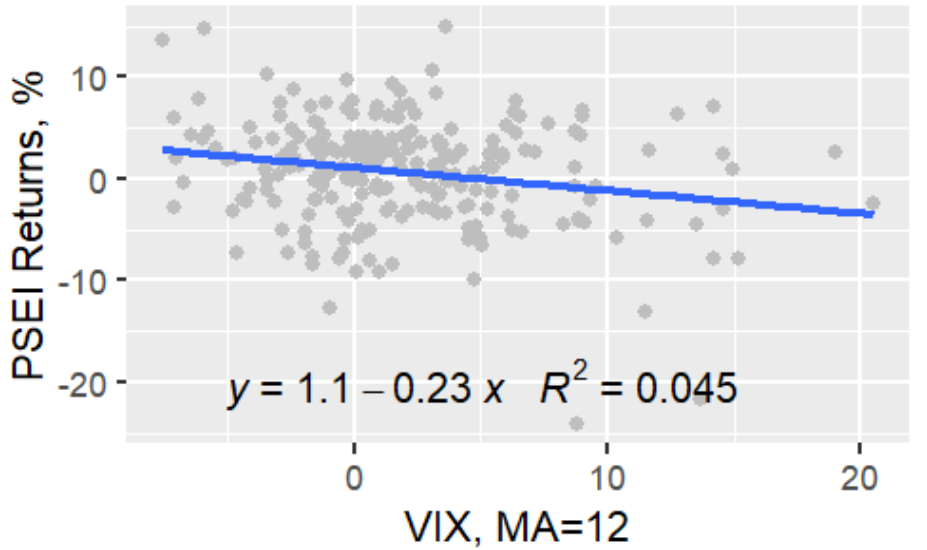


VIX

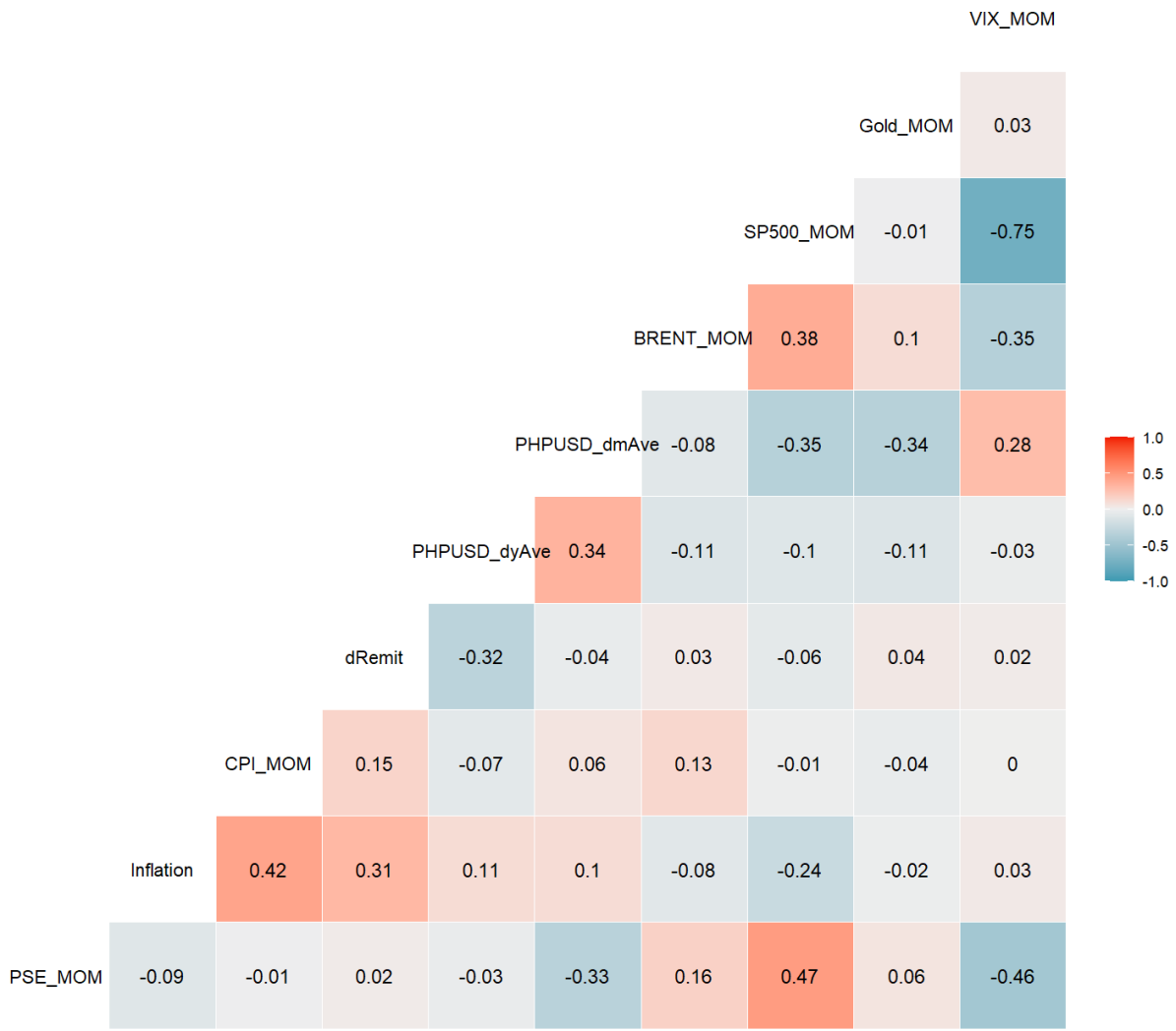

PSEI Returns, %
10
0
-10
-20
y = 3.2 – 0.13 x R² = 0.046
20
40
60
VIX


PSEI returns, %
10
0
-10
-20
y = 0.87 – 0.11 x R² = 0.21
0
50
100
150
200
M-o-M Change in VIX, %


PSEI Returns, %
10
0
-10
-20
y = 0.9 – 0.024 x R² = 0.059
0
100
200
300
Y-o-Y Change in VIX, %


PSEI Returns, %
10
0
-10
-20
y = 1.1 – 0.23 x R² = 0.045
0
10
20
VIX, MA=12

Correlations



Section 4

Econometric Analysis

Subsection 1

Econometric model

Econometric model

- Model 1:

$$PSEI_r = \beta_0 + \beta_1 F_1 ... + \beta_n F_n + \epsilon$$

- Model 2: Using Arbitrage Pricing Model (APM)

$$PSEI_r - R_f = \text{Risk Premium} = \beta_0 + \beta_1 F_n ... + \beta_n Fn + \epsilon$$

The indepedent variables (F), with their expected signs, includes below:

- Inflation, % (-)
- Rate of change in CPI, % (-)
- Rate of change in OFW remittance, % (+)
- Rate of change in PHPUSD exchange rate, % (-)
- Rate of change in oil price (BRENT), % (+)

Econometric model, cont.

- SP500 returns, % (+)
- Gold returns, % (+)
- Rate of change in VIX, % (-)

Subsection 2

Results of the regression

Results of the regression

	Dependent variable:			
	PSE_MOM		RP	
	(1)	(2)	(3)	(4)
Inflation	-0.111		-0.669***	
	(0.175)		(0.187)	
CPI_MOM	0.338		0.970	
	(0.913)		(0.974)	
dRemit	0.029		-0.026	
	(0.038)		(0.042)	
PHPUSD_dmAve	-0.685**	-0.807***	-0.448	-0.518*
	(0.256)	(0.232)	(0.276)	(0.256)
BRENT_MOM	-0.017		-0.006	
	(0.032)		(0.035)	
I(dRemit2)				-0.001
				(0.002)
log(BRENT_Ave)				0.764
				(1.027)
log(Gold_Ave)				0.911
				(1.172)

Results of the regression, Cont.

I(VIX_MOM2)		-0.0004**		-0.0004**
		(0.0001)		(0.0001)
SP500_MOM	0.303*	0.415***	0.283	0.409***
	(0.135)	(0.099)	(0.144)	(0.112)
Gold_MOM	0.015		-0.032	
	(0.086)		(0.093)	
VIX_MOM	-0.060**		-0.066**	
	(0.021)		(0.022)	
I(Inflation2)				-0.058**
				(0.018)
Constant	0.693	0.592	-0.284	-11.249
	(0.723)	(0.318)	(0.777)	(8.433)
AIC	1363.1	1353.05	1349.62	1342.99
BIC	1397.52	1370.26	1383.74	1373.7
R2	0.280	0.280	0.310	0.324
Adjusted R2	0.254	0.271	0.285	0.302
Note:		*p<0.05; **p<0.01; ***p<0.001		

Subsection 3

Regression models

Regression models

- Model 1:

$$PSEI_r = 0.59 + 0.41 \times SP500_r - 0.81 \times PHPUSD_{dm} - 0.0004 \times VIX_{dm}^2 + \epsilon$$

- Model 2: APM

$$PSEI_r = R_f - 11.25 + 0.409 \times SP500_r - 0.058 \times \text{Inflation}^2 - 0.518 \times PHPUSD_r$$

$$- 0.001 \times dRemit^2 + 0.764 \times \log(BRENT) + 0.911 \times \log(Gold)$$

$$- 0.0004 \times VIX_{dm}^2 + \epsilon$$

Section 5

Findings

Findings

- Positive: 1) SP500
- Negative: 2) Inflation; 3) PHP = 1 USD exchange rate, and 4) Rate of change of VIX
- No significant relationship: 5) OFW remittance; 6) Gold; and 7) Oil

Section 6

Recommendations

Recommendations

- Limited on the linear regression relationship(s) between macroeconomic and financial indicators with PSEI returns
- R^2 only ranges from 0.25 to 0.30
- Not very helpful in trading especially with presecence of high-frequency or robo-trades
- A better model suited for the dynamic nature of stock markets returns is needed
- Analysizing the sub-index of the PSEI

Section 7

References

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