The cross-sectional return dispersion with momentum strategyand the spill over across FX and Equity markets, during COVID-19

Mr. Pisit Grittiyarangsan

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การกระจายตัวของผลตอบแทนของสกุลเงิน และหุ้นในแต่ละประเทศ และทฤษฎีโมเมนตั้มในการหาผลตอบแทนในช่วงสถานการณ์ COVID-19

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By	Mr. Pisit Grittiyarangsan
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Thesis Advisor	Tanawit Sae-Sue, Ph.D.

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INDEPENDENT STUDY COMMITTEE

..... Chairman
()
..... Advisor
(Tanawit Sae-Sue, Ph.D.)
..... Examiner
(Associate Professor Kanis Saengchote, Ph.D.)
..... Examiner
(Narapong Srivisal, Ph.D.)

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This paper investigates the relation of momentum strategy and the return dispersion across currency and global equity markets by using 30 currency pairs and 30 global equity indices during last 2 decades. This paper also examines the lead-lag relationship of return dispersions through spillover from one market to another. In addition, we are successfully detected the relation between return dispersion of those market and the significant return by momentum strategy on currency market. However, we cannot detect significant positive return by using momentum strategy on global equity indices, so we cannot use the return dispersion from the lead market as an early indicator for the momentum strategy in the other market.

Field of Study:	Finance	Student's Signature .....
Academic Year:	2021	Advisor's Signature .....

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Pisit Grittiyarangsan

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1. Introduction

Dispersion refers to the range of potential outcomes of investments based on historical volatility or returns. It can be across various underlying assets whose outcomes are measured by risk-adjusted returns or relative return. Cross-sectional return dispersion is defined as the standard deviation of a set of asset returns over a period.

Regarding previous study, dispersion represents opportunities to earn higher active return (Gorman et al., 2010). The superior return above market draws many researchers interest, sparking wide empirical studies, for example, a study of relationship between cross-sectional return dispersion in the stock market and active fund performance (Cao et al., 2020), bringing the criterion to identify skilled managers. Dispersion can appear in various markets of risky assets, e.g. currency, equity and commodity market. This raises my suspect whether the return dispersion in the global currency markets can be used as a signal to enter a momentum strategy on currency pairs in the present day. Previous studies such as (Lustig et al., 2011), (Burnside et al., 2011), (Menkhoff et al., 2012b), and (Moskowitz et al., 2012), have documented that simple momentum strategy on currency pairs can already generate profit. With return dispersion as an additional factor, we hope to find significantly more profit from momentum strategy.

In addition to the currency market, we would like to investigate the return dispersion in the global equity markets as well. Because both currency and equity markets share some common macroeconomic risk (Grobys et al., 2018), we suspect that a similar relation between return dispersion and momentum strategy returns may occur in the equity markets. Furthermore, we would like to investigate the lead-lag

relationship between return dispersions from the currency to equity markets. We suspect that return dispersion from one market could possibly spillover to another similar to the idea of volatility spillover between markets. If the lead-lag relationship of return dispersions is detected, we can use the return dispersion from the lead market as an early indicator for the momentum strategy in the other market.

2. Literature Reviews

(Menkhoff et al., 2012b) have been identified whether the characteristic of FX markets are large transaction volumes with low transaction fees ,and very much liquid. In addition, short selling permission also allowed through matket participants that would affect operationalizing of trading strategies such as momentum.

Consequently, researchers have been paid attention to exploring momentum trading in the cross-section of currency returns. Previous literature typically studied on the time series of currencies momentum which currencies are traded regarding various mechanical signals that employed to momentum strategies (Okunev & White, 2003). The strategies did not consistently generate profit in the long period due to many traders learn how to exploit them.

On the other hand, (Lustig et al., 2011), (Menkhoff et al., 2012a), and (Moskowitz et al., 2012) employed a one-month formation period and a subsequent one-month holding period to compute currency momentum strategy. As a result, the emperical evidence suggested whether the combination of 1-month holding and 1-month formation period generated the largest payoffs on currency momentum strategies. They also conclude that spot movement is the key driver of momentum payoffs.

Nevertheless, currencies with higher interest rates tended to associate with high-momentum currencies than other currencies, momentum strategies that implemented in currency markets and carry strategies are quite different.

Research problems

The research problem focuses on the following:

- Does momentum strategy actually generate return significantly on our observing period?
- Does high return dispersion on exchange rate associate with high momentum return ?
- Does the level of high and low degree of dispersion is significantly difference on momentum return ?
- Does it have correlation between return dispersion of currency and return dispersion of equity ? Which of the following lead/lack one another?

3. Data

3.1 Obsevation Period

3.1.1 General periods

The general period refer as last 20 years ,since we investigate from the start of the new currency onwards. The establishment of Euro currency affect the movement of currency in europe area, our investigation would examine whether the return from menmentum still exist with the new era.

3.1.2 COVID-19 period

At the beginning of 2020, WHO declarred the COVID-19 outbreak as global health emergency and global pandemic. Likewise, financial markets worldwide have been severely affected by this epidemic. Hence, we coincide that the period to document COVID-19 should begin with 1 January 2020 until present time. The selected duration is expected to be an effective comparable period to relieve our research question.

3.2 Data Source

Variable name	Description	Data Source
FC_i/HC	Currency pair (30 x 1 against USD)	Reuter
S_t^k	Spot rate at time t	Reuter
F_t^k	1-month Forward rate at time t	Reuter
R_t^e	Global equity index returns of country e	Reuter

3.3 The relationship between dispersion on equity and FX

In reality, the relationship between equity and exchange rate is less correlated, Some literature documents that is no relationship between the exchange rate and stock price. In contrast, few literature claims that once global financial crisis (2008) hit markets, the correlation completely changed to become positively linked, with the stock market moving in the same direction as the currency pair.

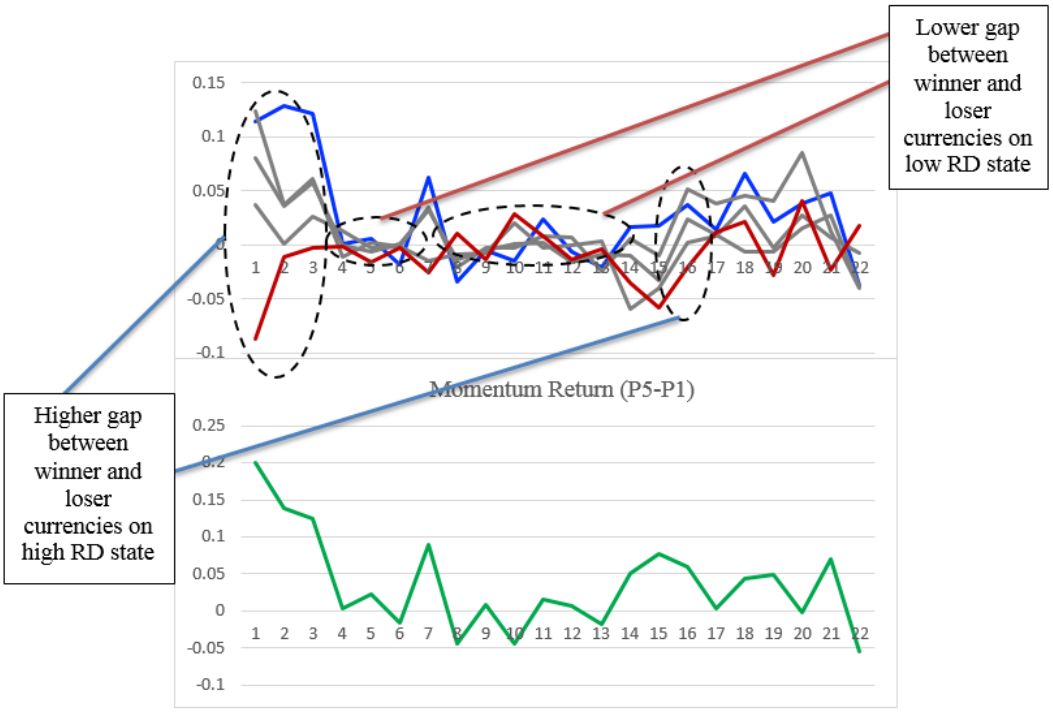
However, the clear link between equity and FX markets is still questionable. We suspect whether the fear of investor sentiment could possibly be a link. Perhaps,

the dispersion of return in FX market could spill over to equity market and vice versa. Additionally, in the severe market condition, many investors especially institutional tend to shift their investment into safe haven currencies i.e. JPY,USD and CHF. Major investors who react first potentially incur the deviation of interval gap on price of asset and securities. In the case that investment allocation shifts from equity market to those currencies, it may consequently create both RD on equity and FX markets which implicate the correlation of those market as well.

Hypothesis Development

1) We anticipate that in the period when the return dispersion is high, the momentum strategy should generate high return.

Fig A: A simulated example of return across currency pairs



Return generated by currency momentum is calculated through the difference between return of winner and loser currency groups. In other word, high discrepancy between those groups will create high momentum payoff. On the left side of Fig A (month 1 – 3), high return dispersion is detected as high deviation of return on each currencies away from the mean can be seen. Thus, there is high possibility that the gap between winner (P5) and loser (P1) group will be very different, resulting in high momentum payoff. With low dispersion state in the middle of Fig A (month 4-6 and 8 – 14), there is high concentration of return on each currency group members around the

mean, which result in lower possibility to create high gap between loser and winner currency groups.

Furthermore, (Eriksen, 2019) evidence also supported the link between RD and momentum return that it can be understood through its relation to monetary conditions. In times of global economic stress, Fed's broad monetary policy stance is expansive (lower interest rate), resulting in high return dispersion across countries and that corresponding with well performing of momentum strategy. For this rationale, our assumption toward momentum pay off with high state of RD is high.

2) We ecpected that RD on COVID period should be high. Because of most central bank across the globe have intervened their capital market but at different time. The unexpected increases in dispersion are associated with lagged policy adjustment across countries. The countries that monetary and fiscal policies are modulated ahead might cause their asset return to disperse away suddenly from other countries. Accordingly, the overlap of time between countries policy adjustment is one argument that we consider as a cause of high return dispersion across countries

The role of intervention mainly influenced market by changing interest policy and increasing quantitative easing level. Asymetry of policy adjustment level on differ state caused inflow/outflow move differently across countries, which lead asset returns fluctuated. For this reason, return on sensible asset tend to deviate from the mean return across countries.

In consequence, the methedology section will refer these assumptions as base reference on the hypothesis testing.

The Research Hypotheses

H1: Momentum strategy generates significant return especially on COVID period

We construct momentum portfolio of those comparing periods.(General and COVID-19). Test statitic can determine whether momentum payoff from momentum strategy on COVID-19 is more significant than general period.

H2 : The high return dispersion on exchange rate associate with high momentum return

To ensure that our assumption base is true before applying momentum strategy, we begin by seperating the cross-section return dispersion on observing period into high and low state. Then, we can test whether the high state of dispersion is actually associated with return as assumption specified. The result is expected to be significant at all levels. Additionally, the difference between high and low states that correspond with momentum return can be examined by this hypothesis. The difference state of return dispersion is expected to be significant at all level as well.

H3 : $Y_{2,t} = \alpha_2 + \sum_1^n \beta_{2i,i} Y_{i,t-i} + \epsilon_{2,t}$, $Y_{1,t} = \alpha_1 + \sum_1^n \beta_{1i,i} Y_{i,t-i} + \epsilon_{1,t}$

We run the regression model to determine lead-lack relationship between correlation of return dispersion on equity index and currency.

4. Methedology

4.1 The monthly return

The monthly returns of currency and equity index are constructed to test the dispersion of return and lead-lack relationship. We simply calculate the monthly return by measuring the change of underlying asset price. The percentage change between close price of previous month and today close price is used to identify monthly return. For the currency return, 1-month interest differential between pair of currency are adjusted before computing net monthly return, this adjustment is to make the sure that the currency return represents the true net return of carry trading across currencies.

$$R_t^k = \frac{S_t^k - S_{t-1}^k}{S_{t-1}^k}$$

We define currency monthly return by R_t^k where k refer to pair of currencies, S_t^k is the close price of exchange rate today and S_{t-1}^k is the close price of exchange rate on previous month.

$$R_t^e = \frac{S_t^e - S_{t-1}^e}{S_{t-1}^e}$$

We define stock index return by R_t^e where e refer to country index, S_t^e is the last price of index today and S_{t-1}^e is the last price of index on the previous month.

The transaction cost are ignored, purchasing and selling price both are considered by mid rate. The monthly returns collected across period to use for the purpose of testing level of RD between those period in the next study.

4.3 Cross-sectional return dispersion

4.3.1 Cross-sectional currency return dispersion

We construct cross-sectional RD according to (Verdelhan, 2012), 30 foreign exchange rates employed to form a currency portfolio to compute RD across currencies. The cross-sectional currency return dispersion defined as the cross-sectional volatility across all currency pairs that we have selected following by

$$RD_t^{FX} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(R_t^k - \overline{R_t^k})^2}$$

Where RD_t^{FX} denotes monthly return dispersion of all 30 currencies that against USD. R_t^k is the monthly return of each currency ,$\overline{R_t^k}$ is the average monthly return across all currency (no transaction costs). The cross-sectional dispersion of currency returns captures the extent to which currencies offer returns that center around (or diverge from) average foreign currency return ($\overline{R_t^k}$). In other words, RD_t^{FX} measures the aggregate amount of heterogeneity in currency returns.

4.3.2 Cross-sectional global equity index return dispersion

The cross-sectional stock return dispersion (RD) have been employed in equity market studies. (Jiang, 2010) and (Chichernea et al., 2015) used individual stocks listed on the NYSE and AMEX, whereas (Stivers & Sun, 2010) utilized equity stock portfolios. We extend those literatures approach to global equity index, our sourcing countries index are conformable with currency that we used as observation in FX part.

For this rationale, we employ 30 global stock indices to compound cross-sectional index return dispersion.

$$RD_t^{Equity} = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(R_t^e - \overline{R_t^e})^2}$$

Where RD_t^{Equity} denote daily return dispersion equity index ,n=30 , R_t^e is the monthly return on each equity index e ,and $\overline{R_t^e}$ is the average monthly return across all index (no transaction costs). The cross-sectional dispersion of global index returns are expected to be at high level throughout COVID-19 period.

4.4 Momentum Portfolio

Regarding to the previous empirical test (Eriksen, 2019) that established a clear link between RD and momentum payoffs, in times of global economic stress, currency momentum payoffs are considerably larger than at other times. For this reason, we examine momentum strategy on our observation period, which we expected this strategy to generate more excess return.

4.4.1 Currency Momentum Portfolio

In order to compute the momentum return, we consider using (Menkhoff et al., 2012a) method to form currency portfolio by dividing our observations (30 x 1 currencies) into 5 groups (6 x 1 currency pairs per group), sorted in ascending order regarding to previous month performance (Group 1 provided lowest 1-month lagged

return, Group 5 provided highest 1-month lagged return). Then, the zero-investment strategy is applied by 2 opposing positions: short 1-month forward on loser currencies (group 1) to long 1-month forward on winner currencies (group 5). The 1-month swap point of each currency pairs already took interest differential into account before we net the return at maturity. Portfolio is rebalanced monthly to realize momentum payoff by computing opposite position to those currency that we have positioned. Selling currency pairs that we have held on spot market ,and buying back currency pairs that we have shorted to clear all position.

4.4.2 Global equity index Momentum Portfolio

We suspect that if the return on currency can be generated by momentum strategies, it should present in equity market too. Thereby, we apply this strategy on global equity index to examine our suspect as well.

For the momentum strategy used in equity index, we repeat the same methedology as we approach on currency. To be precise, we compute exactly same steps on hypothesis ensuring whether our return generated on global index is significant by using momentum strategy.

4.5 The spillover cross return dispersion on currency and global equity index

In this section, we will examine the spillover of RD between currency and global equity markets. We employ VAR model to capture the relation between RDs on those markets. VAR model basically can detect the correlation between one variable with other variables and itself, for example, if variable Y can be explained by variable X rationally, i.e. the value of X in the past (X_{t-1}, X_{t-2} ,…, X_{t-n}) affect the change of

Y on this period. In our study, we believe that both RD in currency market and RD in global equity market are serially correlated with themselves. If the RDs between the two markets have lead-lag relationship, the VAR model would capture the effect along with their serial correlations. Additionally, VAR is mostly used to detect volatility spillover between markets/ assets /countries. With only adjustment in the variable as RD instead of volatility, we believe that VAR is an appropriate model choice for the analysis.

The regression model can be written as:

$$Y_{2,t} = \alpha_2 + \sum_{1}^{n} \beta_{2i,i} Y_{i,t-i} + \epsilon_{2,t} \quad , \quad Y_{1,t} = \alpha_1 + \sum_{1}^{n} \beta_{1i,i} Y_{i,t-i} + \epsilon_{1,t}$$

5. Empirical Result

Table 1.1 Monthly-average return of 30 exchange rates against US dollar during January 2000 to the end of December 2020: monthly data are downloaded from Datastream with sample period from January 2000 to December 2020. The following countries or regions are included: Australia,, Canada, Hong Kong, Czech Republic, Denmark, Hungary, India, Indonesia, Japan, Kuwait, Mexico, New Zealand, Norway, Philippines, Poland, Saudi Arabia, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, the United Kingdom, Bulgaria, Pakistan, Romania, Croatia, Russia ,and the Euro

CCY	AUD	CAD	HKD	CZK	DKK	EUR
Mean	0.31%	-0.03%	0.03%	-0.12%	0.43%	0.08%
SD	3.62%	2.62%	0.15%	3.48%	3.16%	2.82%

CCY	HUF	INR	IDR	JPY	KWD	MXN
Mean	-0.16%	-0.16%	-0.23%	0.19%	-0.04%	-0.08%
SD	4.09%	2.07%	3.38%	2.68%	0.59%	3.41%

CCY	NZD	NOK	PHP	PLN	SAR	SGD
Mean	0.42%	0.00%	-0.16%	-0.22%	-0.01%	-0.03%
SD	3.75%	3.38%	1.79%	3.91%	0.12%	1.59%

CCY	ZAR	KRW	SEK	CHF	TWD	THB
Mean	-0.06%	-0.03%	0.34%	-0.07%	0.07%	-0.18%
SD	4.94%	3.11%	3.65%	2.90%	1.40%	1.92%

CCY	GBP	BGN	PKR	RON	HRK	RUB
Mean	0.00%	-0.05%	0.06%	0.04%	-0.13%	-0.06%
SD	2.53%	2.82%	1.74%	3.23%	2.92%	3.90%

5.1 Momentum return on currency portfolio

Table1.2 Momentum Strategy Reporting Performance: last 2 decades (2000-2021): The table exhibits descriptive statistics of return on each portfolios. Portfolio constructions are followed by MOM(1,1) 1-months lagged formation/holding period return as we have set up. The HML represents average monthly return on momentum strategy. We construct portfolio during last 2 decades to examine whether there still an existence of momentum return which correspond with previous literature. Test statistic 2.60 indicates that applying momentum strategy can generate positive return on average which are significant at all levels.

	Mean	SD	SR	t-stat
P5	0.33%	0.0242	0.1346	2.14
P4	0.15%	0.0184	0.0838	1.33
P3	-0.06%	0.0154	-0.0374	-0.59
P2	-0.14%	0.0169	-0.0850	-1.35
P1	-0.25%	0.0201	-0.1259	-2.00
HML	0.58%***	0.0353	0.1637	2.60

Table 1.3 Momentum Strategy Reporting Performance: last decade (2011-2021): This table reports the result by repeating same procedure on table1.1 but we compute with difference time period (2011-2021). The statistical result provides t-stat 0.7 which is not significant with momentum strategy even it gernerates positive return. The deviation across period is high comparing to the average return, resulting insignificant test statistic.

	Mean	SD	SR	t-stat
P5	0.28%	0.0248	0.1136	1.24
P4	0.24%	0.0174	0.1356	1.49
P3	0.06%	0.0154	0.0417	0.46
P2	0.10%	0.0142	0.0720	0.79
P1	0.08%	0.0161	0.0492	0.54
HML	0.20%	0.0318	0.0638	0.70

Table 1.4 Momentum Strategy Reporting Performance: COVID19 period(2020-2021): Table represents momentum return generated during COVID19 period. Generally, COVID19 period provides highest return associate with higher risk. Test statistic of 0.98 arise from high average return (1.32%) with higher risk level (0.0468).

	Mean	SD	SR	t-stat
P5	0.80%	0.0428	0.1876	0.65
P4	0.18%	0.0141	0.1265	0.44
P3	-0.37%	0.0197	-0.1897	-0.66
P2	-0.55%	0.0144	-0.3831	-1.33
P1	-0.52%	0.0162	-0.3181	-1.10
HML	1.32%	0.0468	0.2815	0.98

Currency momentum implemented through last 20 years, 10 years, and COVID-19 period. The investigation result shows evidence of return that associate to risk, higher risk generates higher momentum return on average. Nevertheless, the positive return generated by momentum in short time period seems to be a coincidence. The evidence suggests that momentum return on last decade and Covid-19 regime show an insignificant momentum return with test statistic of 0.7 and 0.98, respectively. Regarding our observations, it can be concluded that momentum strategy would significant provide significant positive return on average across 20 years period. This is conforming with previous study that work on a period between 1987-2010

5.2 Momentum return on global equity indices

We examine the same strategy on global equity indices to indicate whether the momentum return exist on this market. The investigation on global equity indices found a contrary result.

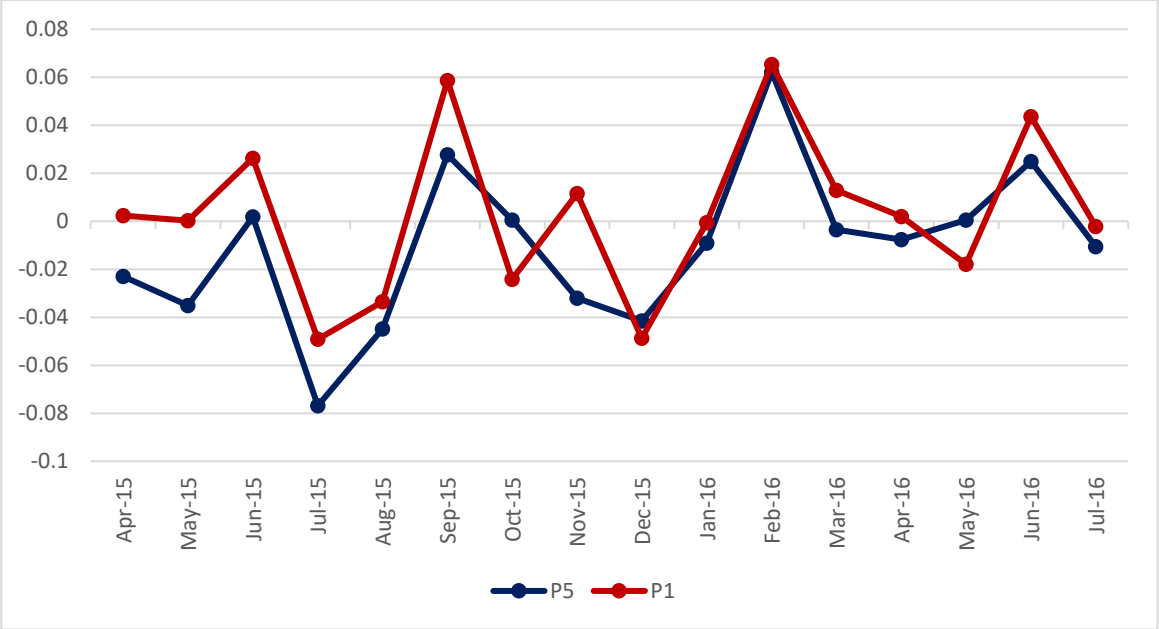
Table 1.5 Equity Momentum Reporting Performance: last 2 decades (2000-2021): This table reports the result by repeating same procedure on table1.1 but we compute with equity indices. The statistical result provides t-stat -2.2321 resulting an opposite outcome to currency momentum. The MOM_{11} strategy on equity indices generate negative return on average.

	Mean	SD	SR	t-stat
P5	0.0042	0.0436	0.0972	1.5435
P4	0.0039	0.0448	0.0867	1.3761
P3	0.0027	0.0424	0.0648	1.0281
P2	0.0055	0.0433	0.1277	2.0276
P1	0.0093	0.0514	0.1813	2.8781
HML	-0.0051	0.0362	-0.1406	-2.2321

Our empirical evidence suggests that the negative return caused by the inconsistence of return of winner and loser group over the observing period. Most of indices that we have sorted on the previous month mostly switch their place in the next

period, and they tend to change position over the time. This created inconsistent return that winner and loser group generated, the past winner cannot continue to perform well in the next period as well as past loser that are not continuing to perform badly, they lack consistency unlike in portfolio of currency.

Fig 1 The return on Winner group (P5) and Lose group (P1) over 16 consecutive months.



According to Fig1, the red line (P1) lies above blue line (P5) most of the period implicating that past winner perform under past loser in the next period after formation period that led to negative momentum return. Theoretically, past winner (loser) group should continue to perform well (badly), so they will generate positive momentum return

	LOW	MED	HIGH
LOW (10.4%)	19.23%	80.77%	0.00%
MED (76.0%)	11.58%	79.47%	8.95%
HIGH (13.6%)	0.00%	50.00%	50.00%

Table 1.6 The transformation matrix of equity indices RD: Dividing observation into 3 stages, we classify data that fall within one standard deviation of the mean as medium stage RD. Above and below this level

	LOW	HIGH
LOW (60.8%)	82%	18%
HIGH (39.2%)	30%	70%

Table 1.7 The transformation matrix of equity indices RD: Dividing observation into 2 stages, We use mean of the sample to divide observation into 2 stages. Above and below sample mean are arranged as high and low RD, respectively.

In addition, the degree of dispersion may be another rational behind the arrise of inconsistant momentum return on equity indices. The degree of dispersion is not last long from period to period and most of the observations are classified as low stages. Both transition matrix on 2 stages and 3 stages also suggests that half of high state drop to the lower state, only few of them stay at the same level that caused the momentum strategy not work effectively.

5.3 Cross-sectional currency return dispersion and momentum returns

Table2.1 Momentum and currency return dispersion. The momentum return measures use a monthly frenquency along January 2000 until end of December 2020. We distinguish the level of RD on each period by using mean of the whole sample as a reference point to divide sample into 2 stages. The above and below sample mean are corresponding to high and low dispersion stage. The dummy variables dH, t and dL, t set to verify those stage on the regression analysis, dH, t assign for the RD that are above sample mean, and dL, t for RD below sample mean. The following regression model: $R_{MOM,\,t} = \alpha_{High} d_{H,\,t} + \alpha_{Low} d_{L,\,t} + e_{i,\,t}$ is used to examine the relationship.

	Momentum (Long-Short)		
	High state	**Low state**	**High-low**
RD^{CCY}	0.0093***	0.0035	0.0058
	[2.61]	[1.22]	[1.26]

	Long leg		
	High state	**Low state**	**High-low**
RD^{CCY}	0.0047*	0.0023	0.0024
	[1.92]	[1.17]	[0.76]

	Short leg		
	High state	**Low state**	**High-low**
RD^{CCY}	-0.0046**	-0.0012	-0.0034
	[-2.26]	[-0.73]	[-1.3]

Although, the momentum strategy on COVID-19 period generates insignificant result as table 1.4 display, but statistical result cannot be concluded that momentum return is correspond with high dispersion period rather than low dispersion period due to a very short time period. We then examine on the last 20 years range to verify the relation with dispersion level and momentum return. The regression analysis displays evidence that corresponded with what literature concur. The period with high cross-sectional RD provides significant positive momentum return at all significant level (test-statistic of 2.61), whereas the period with low cross-sectional RD appears an insignificant relationship with momentum return (test-statistic of 1.22). However, the difference between effects of high and low dispersion on momentum return is not that statistically difference. Regarding test-statistic of 1.26 on the difference between high and low state against momentum return, our result indicating whether there is no significant effect either period is high or low cross-sectional RD to the momentum return. Our regression outcome is contradicted with what literature has specified during 1987-2010 regime. The inconsistence result caused by the movement of currency return across countries during last decade is not deviate from each other that much while

momentum still generate positive return. Thus, the difference between stage of cross section RD on momentum return shows an insignificant result.

Table 2.2 We use RD that calculated from 5 portfolios instead of using RD across all 30 currencies in order to examine inconsistent result from previous part. The RD is constructed following same methodology as literature used to compute RD.

	Momentum (Long-Short)		
	High state	**Low state**	**High-low**
RD^{CCY}	0.0355***	0.0025	0.0330***
	[5.21]	[1.10]	[4.59]
	Long leg		
	High state	**Low state**	**High-low**
RD^{CCY}	0.0237***	0.0010	0.0227***
	[5.08]	[0.64]	[4.62]
	Short leg		
	High state	**Low state**	**High-low**
RD^{CCY}	-0.0118***	-0.0015	-0.0102**
	[-2.95]	[-1.14]	[-2.44]

Using return dispersion across portfolio has a significant impact on the difference between high and low dispersion degree with momentum return at all significant levels. On high dispersion state, regression analysis provides evidence that high stage RD has a significant effect (test-statistic 5.21) with an average return of 3.55% monthly, while low RD regime generates an average return of 0.25% per month which is statistically not different from zero at this stage. The evidence strongly indicate that momentum returns are generally driven by both long and short legs. Those position

correspond very well with high portfolio RD rather than low portfolio RD on our observation length which is conformable with previous literature.

5.4 Co-movement between cross sectional RD on currency and global equity indices

Fig2. The graph represents cross-sectional currency return dispersion in global equity and currency markets: this figure plots monthly of the return dispersion are similar in most direction.in the currency market and global equity market. The graph implicates the co-movement between both markets, the trend lines

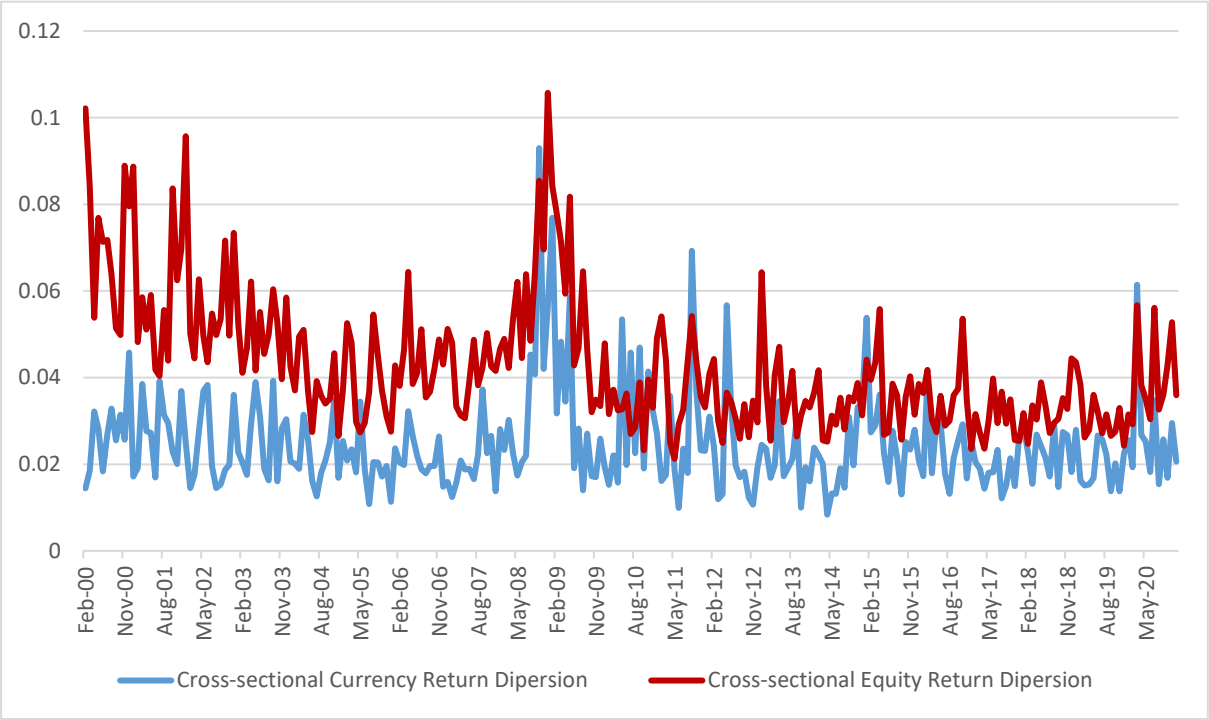


Table 3.1 Testing the order of integration: this table reports the ADF tests for currency ($RD^{Currency}$)and equity return dispersions (RD^{Equity}). The corresponding p-values are given in parentheses. The sample period is January 2000 to December 2020.

	T-Stat	1%	5%	10%
$RD^{Currency}$ **Z(t)**	-12.307	-3.460	-2.880	-2.570
RD^{Equity} **Z(t)**	-9.190	-3.460	-2.880	-2.570

The Dicky Fuller test detect no unit-root on both currency RD and equity RD with MacKinnon approximate p-value for Z(t) = 0.0000. Then we begin testing of the co-movement regarding VAR model.

Table 3.2 VAR model estimates of cross sectional currency RD and global equity RD :
Regression estimates from the baseline equation:
$Y_{2,t} = \alpha_2 + \sum_1^n \beta_{2i,i} Y_{i,t-i} + \epsilon_{2,t}$, $Y_{1,t} = \alpha_1 + \sum_1^n \beta_{1i,i} Y_{i,t-i} + \epsilon_{1,t} \varepsilon i$,

	CCY-RD	EQT-RD
CCY-RD		
L1	0.1458**	0.3228***
	[2.37]	[5.07]
L2	0.2192***	-0.0969
	[3.72]	[-1.46]
EQT-RD		
L1	-0.0131	0.4233***
	[-0.22]	[6.89]
L2	0.0712	0.2330***
	[1.25]	[3.63]

We hypothesize to find whether co-movement on both markets exist. The global equity index returns are constructed based on each domestic currencies of each country indices for controlling risk that caused by specific currency base. The regression applied to examine the relationship between cross-sectional return dispersion across market and itself. The regression applied with lag (1/2) implicating that the test considered the link between cross-sectional currency RD and cross-sectional global equity RD as well as the relation with itself on last period and last 2 periods. The result implies that cross-sectional currency RD associates with global equity RD significantly on last period with t stat of 5.07. The evidence indicates that we found the uni-

directional relationship meaning that change of cross-sectional currency RD in the past can affect the change of cross-sectional global equity RD. The dispersion of return on currency across countries also related to RD of itself in the past 1 and 2 periods with all significant level (t-stat of 2.37 and 3.72). On the cross-sectional global equity RD, the statistical result implicated that it related to itself in the past 1 and 2 periods with t-stat of 6.89 and 3.63, respectively. Additionally, there is no statistical evidence that cross-sectional global equity RD result in cross-sectional currency RD movement, the co-movement of return dispersion only detected on the currency market to the equity market.

6. Conclusion

We found that applying momentum strategy with MOM (1,1) (1-month formation period, 1-month holding period) on Covid19 period is not significantly generated positive momentum return with monthly observations on short period of time. We have empirically investigated the corresponding of high RD that associate with momentum return across currencies. The evidence supports that the relation between momentum payoffs and RD is positively correlated at all significant level. We can determine the distribution of return and connection between global equity market and foreign exchange market, the dispersion of return on two markets are co-move in the same direction. The result indicated that return dispersion on currency market lead the return dispersion on equity index 1 period ahead. Initially, we expect that if RD was spill over across market, we could use this as an early indicator to signal the momentum strategy on another market, since our empirical indicated the association between RD and momentum payoff. Thus, if we detect high RD on currency market it could be a sign to generate momentum return on equity market in the following period. Unfortunately, this early detection doesn't lead to momentum strategy on equity since the momentum strategy on equity market presents negative return over the period, it cannot generate profit due to inconsistency of return on winner and loser group.

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VITA

NAME	Pisit Grittiyarangsan
DATE OF BIRTH	26 October 1995
PLACE OF BIRTH	Bangkok Thailand
INSTITUTIONS ATTENDED	Chulalongkorn University
HOME ADDRESS	130/19 Charun Sanitwong 20 Ban Chang Lo Bangkoknoi Bangkok 10700