

# **Integrating Investment and Foreign Exchange Returns in a Classroom Portfolio Simulation**

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## **Abstract**

This paper describes a class project used in the international finance class at the authors' university. The project combines investment and exchange rate movements to provide a realistic model of international investment. The simulation project introduces students to purchasing power parity, the international Fisher effect, interest rate parity, the expectations theory of forward rates, and the return components of international investing. The simulation provides students the opportunity to see these theories in action over time using current data and reinforces the applicability of these concepts in the "real" world.

## INTRODUCTION

Simulations can provide a connection between classroom and professional environments and offer a more dynamic learning experience (Seaton and Boyd, 2008). This occurs because simulations involve the student directly with the components of the simulation rather than just theorizing about the material or solving static problems (Doyle and Brown, 2000). Students feel that simulations are an effective means of learning material. Research indicates that they can learn decision making, strategy development, and group dynamics from a properly constructed and implemented simulation (Betts and Knaus, 2006). Simulations in the form of classroom gaming exercises have also been shown to enhance student learning (Cebula and Toma, 2002).

Business education accrediting agencies have adopted standards that encourage simulation. One of the assessment goals of the Association to Advance Collegiate Schools of Business International (AACSB International) is to more closely align what students are learning in the classroom with the skills they need in business. Simulations can be an effective pedagogical tool to achieve this charge since they encourage students to develop a strategic focus in that they often consist of multiple period analyses where students are forced to examine the results of decisions they made.

In finance, simulations are most commonly used in investments. There are three commercially available, web based, widely used investment portfolio simulations: *Stock Trak*, *OTIS*, and *Stocknavigator*. The existence of an active market in portfolio simulations indicates the widespread usage of these simulations. These portfolio simulations offer the professor and student a well-developed simulated trading platform. With the exception of book publisher simulations, other areas of finance offer fewer commercially available simulations. Thus,

professors who wish to use simulations are often forced to develop their own. This may explain why only about 23 percent of finance faculty use simulations in the classroom (Faria and Wellington, 2004).

Although the commercially available investment portfolio simulations allow students to trade a variety of financial instruments, they are not conducive to teaching international investing. For example, *Stock Trak* allows students to trade stocks, bonds, mutual funds, futures, options, futures options, and a limited number of spot currencies and commodities. Additionally, students can trade stocks on approximately 20 international stock markets. However, a drawback to *Stock Trak* and other commercially available portfolio simulators is that in international investing they only show the total return. An important part of international investing is that home currency returns are derived from not only the domestic return of the underlying investment, but the gain or loss on the currency when converting to dollars.

For the most part, existing simulations and classroom exercises for international topics are designed to teach students basic international concepts. For example, Sandler (2008) provides a project that requires students to use regression analysis to forecast foreign exchange rates. This project allows the student to compare their forecast to a market based forecast calculated using spot and forward rates. Classroom exercises use Excel to develop interest rate parity (Arnold and Buchanan, 2004) and teach students how to take advantage of triangular or covered interest rate arbitrage (Marshall, 2004). Holowczak (2007) presents exercises using real time data to examine triangular arbitrage, covered interest arbitrage, and forward rate quote spread models.

Neither commercially available portfolio simulators nor published research provides a model that combines an investment simulation with exchange rate quotes to create an integrated international investment simulation that reflects both investment and foreign exchange risk and

returns. This paper seeks to fill that void. The remainder of the paper is organized as follows. The next section details the portfolio simulation. Section III describes the pedagogical importance and the last section concludes the paper.

### **Details of the International Portfolio Simulation**

Understanding international financial markets and currencies is critical for today's finance graduates. Practically all U.S. based Fortune 500 corporations have about half of their assets and income in foreign countries (Shapiro, p. 10). The recent downturn of financial markets worldwide instigated by sub-prime mortgages and the resultant banking carnage in the United States underscores the inter-relationship of domestic and foreign economies and financial markets. The soon-to-be-graduate needs a thorough grounding in the theories undergirding international finance and exposure to their application. The simulation is designed to do this in an international investment portfolio setting.

A U.S. based investor seeking dollar returns by investing in domestic and foreign stock markets is confronted with three challenges: determining whether the domestic or foreign markets will rise or fall, when converting foreign holdings to dollars determining whether foreign exchange (FX) gains or losses will augment or offset any market gains or losses, and determining what portfolio weights to assign to each market. Crucial to understanding movements in a country's economy, markets and currency are the four fundamental economic theories of foreign exchange: purchasing power parity, interest rate parity, the international Fisher effect and the expectations theory of forward rates. These theories are best understood by observing financial currency and market movements. The portfolio simulation is designed to give students "hands on" experience with the challenges of investing in foreign markets and currencies.

The simulation is designed to track the movement of major stock indexes and foreign exchange rates relative to the United States dollar in seven countries: Mexico (MXX, MXN), Brazil (Bovespa, BRL), Australia (AORD, AUD), Japan (N225, JPY), China (SSEC, CNY), Germany (DAX, EUR) and the United Kingdom (FTSE100, GBP). In addition, domestic investments are allowed (Dow, USD). These indexes were chosen based upon three factors: the portfolio's geographic scope, the mix of advanced and emerging markets, and currencies. A correlation analysis filtered out many potential indexes. For example, the S&P 500, NASDAQ 100, Toronto market index were excluded because their high correlations with Dow. Likewise, the CAC40 of France was excluded. China, Mexico and Brazil were selected to account for emerging markets. Although other indexes such as Hong Kong and/or India could be added, it was felt that this would unnecessarily increase the weight of Asia and emerging markets. The resulting indexes represent a broad geographic cross section and include countries with floating and fixed (within a narrow band) exchange rates.

Students are grouped into two member teams. Each team is given USD 10,000,000 at the inception of the simulation, which lasts for 12 weeks. Teams can convert their dollars and invest in the various indexes by taking a long or short positions. Teams also can invest in the Dow Jones Index. Any monies not invested in foreign indexes or the Dow are automatically invested in 10-year U.S. Treasury Notes. All teams use the same pricing and FX information (source: <http://finance.yahoo.com>) which is posted once a week on the class website. Teams are only allowed to make one portfolio adjustment per week. To facilitate the mechanics of the simulation, teams are given pre-formatted spreadsheets which they use to input the values of the various indexes, FX values and their portfolio rebalancing choices. The spreadsheets automatically convert all foreign currency transactions to USD values.

All teams e-mail their spreadsheets containing updated index and FX values and their portfolio changes to the professor on or before the weekly deadline. The professor merges the pre-formatted worksheets into the master workbook, which updates team performance based on dollar returns.<sup>1</sup> Teams are ranked weekly based on their relative performance.

Because the learning process is inductive, some teams are late in comprehending the intricacies involved in portfolio selection. To give these teams an opportunity to “catch up” beginning in the ninth week teams can borrow an additional USD 10,000,000 at the going 10-year Treasury note rate.

At the end of the simulation teams are graded on two criteria: absolute performance and relative performance. The performance is measured by the periodic dollar return based on the initial USD 10,000,000. The “base” grade for each team of 10 points, with five points per performance criterion, is assigned to simulation performance. The first criterion is based on the Morgan Stanley Capital International (MSCI) World Index. If the team portfolio performance matches or exceeds the MSCI, the team receives 5 points, otherwise 4 points are assigned. Second, teams are ranked on their relative performance. As an example, if there are 10 teams in the simulation, 50 points, five points (accounting for relative performance) times 10 teams, is distributed as follows: 1st team (10 points), 2nd (8), 3rd (7), 4th (6), 5th (5), 6th (5), 7th (3), 8th (3), 9th (2), 10th (1). Thus, the simulation performance can range from 15 (= 5 + 10) points to 5 (= 4 + 1) points. Given that the portfolio simulation comprises 10 percent of the students’ final grade, high performing teams can get 5 extra points and low performing groups can lose 5 points. The competition between teams is designed to keep the students focused. The student instructions for the simulation are included in Appendix A.

Figures 1 and 2 show an entire worksheet for a 12-week simulation period for the winning team in the Spring 2009 semester. The worksheet consists of five sections. The first section on the top of the worksheet to row 6 shows a summary view on performance. It includes the bank balance in row 3, the U.S. dollar portfolio balance in row 4 and its periodic return in row 5, and the net periodic return of the MSCI world index in row 6. Row 2 indicates whether students violate the funding size of U.S. 10 million dollars and additional borrowing of the same amount. The second section, from rows 7 to 23, provides price information: closing prices of stock market indexes, 10-year Treasury note yield, exchange rates and the benchmarking MSCI index. The next two sections show buying and selling decisions and their market values in local currency and U.S. dollar terms, respectively. The last section, from rows 72 to 95, tracks the portfolio balances in terms of the number of holdings, market values in local currency and U.S. dollar terms. For example, cells C24 and C28 show this group decided to buy 30 shares of the Dow and 275 shares of the DAX. Cell D54 shows that the group decided to sell back 50 shares of the DAX. The market values are calculated below in both currencies. These trading activities are reflected on the portfolio balance section of the worksheet both in the share volume and money value terms.

<<INSERT FIGURES 1 AND 2 ABOUT HERE>>

The professor monitors group performance on a weekly basis. Figure 3 shows the performance log, which contains the periodic return of each portfolio and the MSCI world index. The former is used to rank portfolios while the latter is used to measure the absolute performance of each portfolio. To stimulate competition, the professor posts the weekly ranking and periodic returns on the class website.

<<INSERT FIGURE 3 ABOUT HERE>>

There are two items of note in Figure 3. Team 1 and Team 3 both show a penalty of minus one percent. Even if a team does not want to buy or sell any index, it is required to submit this information to the professor. A team is permitted one week in which they do not submit the required trading information. Each time a team exceeds this limit it is penalized one percentage point on its final portfolio return.

In the next to last week, Team 3 and Team 9 both show an extraordinarily high balance. These teams were near the bottom of the performance rankings and both decided to take large short positions in the billions. Under the rules, this was permitted. In fact, for both teams this strategy is optimal since they had little to lose even if the position was a loss. This simulation had been used for six semesters prior to this and no team had ever attempted this strategy. In future iterations, a short sale limit will be implemented that will limit the amount a team can short to the total money available, USD 20 million, or some fraction of the total funds such as 90 percent.

### **Pedagogical Importance**

The simulation begins approximately three weeks into the semester. The topics of the determination of exchange rates, international portfolio investment and the international monetary system have been covered. Students have been introduced to the concepts of purchasing power parity, the international Fisher effect, interest rate parity, and the expectations theory of forward rates as well as the value of international diversification. The simulation provides students the opportunity to see these theories in action over time using current data. This reinforces the applicability of these concepts in the “real” world.

The first choice that students have to make is which countries to invest in. The students already understand the diversification role that indexes play within a country’s stock market. The

purpose of the simulation is to explore diversification across countries. When extending diversification across national boundaries, the question arises: does the nationality of the host index matter? In other words, should returns of the FTSE 100 (UK) be different from returns of the Nikkei 225 (Japan) or the Dow (US) when measured in dollars? Since returns are based on price changes, this leads to discussion of three fundamental issues: how are prices set in various countries, how is the exchange rate set between two countries, and are arbitrage opportunities available? This engenders discussions on absolute and relative purchasing power parity and the role of arbitrage in FX equilibrium.

To encourage students to conduct a more rigorous examination of the country choice, each team is required to submit a country analysis report. The country analysis report includes an examination of macroeconomic indicators and their effects on stock market performance. Before the simulation game began, a special session was held on the country economic analysis. The deadline for this report is set at the end of the sixth week of the simulation. The assignment is included in Appendix B.

An investment-related issue that is discussed but not fully explored through the simulation is the use of derivatives in international investing. As stated above, the investment choices are designed to address the concepts of international diversification, purchasing power parity and arbitrage. Discussion of sophisticated international investment strategies is beyond the scope of the course.

As the simulation marches across time, students observe movement in spot FX rates. This gives students the opportunity to observe the effect on FX rates over time of changes in interest rates (interest rate parity) which in turn are composed of changes in expected real interest and inflation rates (Fisher theory). This leads to the topic of estimating forward rates (expectations

theory of forward rates). This concept is further explored when the simulation is in its fourth week and the futures market is more closely examined.

In addition to covering the major concepts in FX, the simulation provides fodder for discussion of other international finance topics. The constant change of FX rates lends itself to discussion of the calculation of currency appreciation and depreciation. The repeated observation of exchange rates over 12 weeks gives students an appreciation for the magnitude of different currencies relative to the dollar. Students gain an appreciation for direct and indirect quotes. The fixed Yuan exchange rate compared to the floating rate nature of the other currencies allows students to observe the different effects of fixed and floating rate currencies on dollar denominated returns.<sup>2</sup>

In summary, the simulation gives students the opportunity to understand the roles of purchasing power parity, the international Fisher effect, interest rate parity and the expectations theory of forward rates in modeling the complex relationships between domestic and foreign prices, nominal, real and inflation rates, and foreign exchange rates over time. These concepts usually are not intuitively obvious to students taking their first international finance course. The international portfolio simulation is designed to pique students' interest in and develop their knowledge of these topics. It reinforces the link between classroom instruction and "real world" decisions in an international setting.

The simulation can be used as a foundation for a broader macroeconomic discussion of the effect of a country's competitiveness and role of fiscal and monetary policy on prices, interest rates, inflation and FX. The theories of purchasing power parity, the international Fisher effect, interest rate parity and the expectations theory of forward rates show the relations between expected inflation, real interest rates, nominal interest rates, prices and spot and forward

exchange rates, but do not discuss the cause(s) of change. International macroeconomics delves into this issue. The domestic value of a country's stock market (as measured by a market index) depends in part on the domestic and international desire for the goods and services provided by the underlying companies as well as domestic inflation. The value of a country's currency relative to the United States dollar depends in large measure on two things: the desirability of that country's goods and services by the rest of the world and the fiscal and monetary policies of the host government relative to that of the United States. Furthermore, the appreciation (depreciation) of a currency makes its goods and services more (less) expensive and less (more) desirable on the world market, reducing (increasing) exports and possibly reducing (increasing) stock prices and the underlying market index. The portfolio simulation is designed to help students understand the basic theories of international finance and is a starting point for students' understanding of the macroeconomic complexities of international finance.

## **CONCLUSION**

Simulations can provide a connection between the classroom environment and the real world. In this paper, we present an international investing simulation that allows the student to examine the components of international returns, the underlying asset return and the currency return. In contrast to commercially available investment simulations, this simulation shows the students the effect of each of these return components. Additionally, students see how spot exchange rates move over the period of the simulation.

More broadly, this simulation project introduces students to the basic economic theories of international finance: purchasing power parity, the international Fisher effect, interest rate parity and the expectations theory of forward rates. The simulation also exposes students to macroeconomic differences between countries. Each team submits a country analysis report

which details the various macroeconomic factors in the country and provides a basis for the investment decision in that country's index. By observing changes in the value of investments in various countries in conjunction with FX changes over time, students' knowledge of the fundamental theories of international finance are both broadened and deepened.

## ENDNOTES

<sup>1</sup> Although done on Excel spreadsheets, this simulation may be performed using a web based system or software package. However to the authors' knowledge none are available that perform the tasks specific to this simulation. Furthermore, once the initial workbooks and spreadsheets are set up, the mechanics of running the simulation aren't onerous. Data can be copied and pasted from the Yahoo web site to the class web site and from the class web site to the students' spreadsheets. The only other input required of students is entering the number of shares of their buy/sell investment choices. The students' spreadsheets are e-mailed to the professor who copies them into the master workbook, which performs the calculations and updates the rankings.

<sup>2</sup> On July 21, 2005, Chinese authorities announced that the Yuan exchange rate would be determined by a managed float. The People's Bank of China would manage a conceptual basket of currencies including not only the dollar but also other major currencies such as the euro and the yen. Without knowing how the basket is managed, outsiders could only observe that the Yuan exchange rate is 'sticky,' or practically 'fixed.'

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**Figure 2**  
Figure 2 is a continuation of the student input spreadsheet.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	<b>PRICE</b>	Date	2/6/2009	13-Feb	20-Feb	27-Feb	6-Mar	20-Mar	27-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	5/8/2009
2	<b>Error</b>														
3	<b>10Y Bon</b>		3,976,084.80	3,907,620.23	4,041,060.60	4,066,520.25	5,161,806.17	2,692,701.27	2,694,056.84	290,206.36	276,968.89	277,124.31	170,922.50	171,020.71	171,124.81
4	<b>↓SUM</b>		10,000,000.00	9,745,390.79	9,209,663.20	9,083,257.53	8,827,473.83	9,372,335.03	9,555,528.17	10,106,597.19	10,245,230.87	10,390,651.89	10,456,166.43	10,640,706.80	11,660,719.84
5	<b>Return</b>		100.00%	97.45%	92.10%	90.83%	88.27%	93.72%	95.56%	101.07%	102.45%	103.91%	104.56%	106.41%	116.61%
6	<b>MSCI rtr</b>		0.00%	-1.79%	-7.36%	-10.46%	-18.22%	-5.84%	-1.34%	-0.02%	0.93%	2.66%	1.30%	4.70%	9.49%
48	<b>SELL</b>	Dow	0	0	0	0	100	0	0	0	0	0	0	0	0
49		MXK	0	0	10	20	140	0	0	0	0	0	0	0	0
50		Bovespa	0	0	5	0	10	0	0	0	0	0	0	0	0
51		AORD	0	0	5	0	10	0	0	0	0	0	0	0	0
52		N225	0	0	15	0	10	0	0	0	0	0	0	0	0
53		SSEC	0	0	0	0	0	0	0	0	0	0	0	0	0
54		DAX	0	50	5	0	10	0	0	0	0	0	0	0	0
55		FTSE 100	0	0	0	0	10	0	0	0	0	0	0	0	0
56	<b>MSELL</b>	Dow	-	-	-	-	662,694.00	-	-	-	-	-	-	-	-
57		MXK	-	-	183,242.30	355,043.60	2,386,081.46	-	-	-	-	-	-	-	-
58		Bovespa	-	-	193,573.20	-	371,050.90	-	-	-	-	-	-	-	-
59		AORD	-	-	16,765.00	-	31,117.00	-	-	-	-	-	-	-	-
60		N225	-	-	111,245.70	-	71,731.00	-	-	-	-	-	-	-	-
61		SSEC	-	-	-	-	-	-	-	-	-	-	-	-	-
62		DAX	-	220,669.50	20,073.30	-	36,664.10	-	-	-	-	-	-	-	-
63		FTSE 100	-	-	-	-	35,307.30	-	-	-	-	-	-	-	-
64	<b>↓SELL</b>	Dow	-	-	-	-	662,694.00	-	-	-	-	-	-	-	-
65		MXK	-	-	12,397.57	23,311.36	157,025.53	-	-	-	-	-	-	-	-
66		Bovespa	-	-	81,070.99	-	156,396.59	-	-	-	-	-	-	-	-
67		AORD	-	-	10,826.61	-	19,934.02	-	-	-	-	-	-	-	-
68		N225	-	-	1,194.20	-	728.94	-	-	-	-	-	-	-	-
69		SSEC	-	-	-	-	-	-	-	-	-	-	-	-	-
70		DAX	-	284,111.63	25,791.21	-	46,392.64	-	-	-	-	-	-	-	-
71		FTSE 100	-	-	-	-	49,742.60	-	-	-	-	-	-	-	-
72	<b>B/C</b>	Dow	30	40	40	40	-60	40	40	340	340	340	340	340	340
73		MXK	70	70	60	40	-100	100	100	100	100	100	100	100	100
74		Bovespa	125	140	135	135	125	205	205	205	205	205	210	210	210
75		AORD	75	75	70	70	60	60	60	60	60	60	60	60	60
76		N225	125	150	135	135	125	125	125	125	275	275	275	275	275
77		SSEC	150	150	150	150	150	300	300	300	300	300	300	300	300
78		DAX	275	225	220	220	210	210	210	210	210	210	210	210	210
79		FTSE 100	225	225	225	225	215	215	215	215	215	215	215	215	215
80	<b>MB/C</b>	Dow	248,417.70	314,016.40	294,626.80	282,504.40	(397,616.40)	291,135.20	311,047.20	2,725,980.60	2,748,349.20	2,764,652.20	2,745,938.60	2,792,219.40	2,915,381.00
81		MXK	1,430,669.10	1,355,767.00	1,099,453.80	710,087.20	(1,704,343.90)	1,936,330.10	2,031,517.00	2,093,377.90	2,053,063.10	2,223,484.00	2,258,217.00	2,189,885.00	2,408,558.00
82		Bovespa	5,344,437.50	5,834,306.80	5,226,476.40	5,176,014.97	4,638,136.23	8,215,664.09	8,590,994.27	9,100,665.10	9,335,435.73	9,384,547.40	9,822,075.71	9,930,801.57	10,793,157.54
83		AORD	255,562.50	262,252.50	234,710.00	230,783.00	186,702.00	204,300.00	216,936.00	220,440.00	217,050.00	223,686.00	220,092.00	224,274.00	235,176.00
84		N225	1,009,577.50	1,166,910.00	1,001,211.30	1,021,736.70	896,637.50	993,245.00	1,078,371.25	1,093,730.00	2,465,130.25	2,449,584.50	2,394,697.25	2,468,776.75	2,594,028.25
85		SSEC	327,186.00	348,118.80	339,222.00	312,427.50	328,951.50	684,326.10	712,332.00	725,933.40	733,269.00	751,182.00	734,677.00	743,271.00	787,695.00
86		DAX	1,277,273.25	993,012.75	883,225.20	845,622.80	769,946.10	854,435.40	882,745.50	920,847.90	943,135.20	982,136.40	981,607.20	1,001,584.50	1,031,919.00
87		FTSE 100	965,670.75	942,657.75	875,038.50	861,770.25	759,106.95	826,212.75	838,252.75	866,379.05	856,497.85	879,952.00	893,537.85	912,292.30	969,349.35
88	<b>↓B/C</b>	Dow	248,417.70	314,016.40	294,626.80	282,504.40	(397,616.40)	291,135.20	311,047.20	2,725,980.60	2,748,349.20	2,764,652.20	2,745,938.60	2,792,219.40	2,915,381.00
89		MXK	100,790.38	93,730.65	74,385.43	46,622.71	(112,161.09)	136,241.34	141,943.03	154,487.13	156,417.90	169,329.61	169,413.71	158,434.74	184,203.89
90		Bovespa	2,361,660.41	2,559,467.78	2,188,916.70	2,178,365.80	1,954,957.31	3,649,784.14	3,769,302.50	4,132,908.77	4,281,328.01	4,303,851.14	4,467,016.42	4,534,612.59	5,210,310.18
91		AORD	172,946.13	172,353.12	151,572.49	147,663.32	119,604.10	140,161.91	150,336.80	157,750.11	156,072.48	161,424.55	159,083.48	163,643.93	180,974.22
92		N225	10,977.84	12,690.01	10,747.80	10,465.93	9,111.71	10,356.01	11,011.65	10,910.02	24,565.32	24,675.98	24,659.64	24,966.05	26,305.93
93		SSEC	47,842.60	50,863.33	49,581.54	45,646.50	48,060.71	100,154.57	104,203.04	106,146.13	107,229.72	109,862.08	107,551.54	108,936.10	115,413.19
94		DAX	1,651,504.07	1,278,502.32	1,134,813.31	1,071,901.13	974,245.35	1,158,713.59	1,173,551.58	1,242,206.80	1,239,173.83	1,278,989.97	1,300,831.17	1,328,185.25	1,401,682.97
95		FTSE 100	1,429,776.06	1,356,146.96	1,263,958.54	1,233,567.49	1,063,465.98	1,193,087.00	1,200,075.52	1,286,001.26	1,255,125.51	1,300,742.05	1,310,749.38	1,358,791.03	1,455,323.65

Figure 3

Figure 3 shows the spreadsheet using for comparing team performance and team ranking.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Group #	Portfolio	2/6/2009	13-Feb	20-Feb	27-Feb	6-Mar	20-Mar	27-Mar	3-Apr	10-Apr	17-Apr	24-Apr	1-May	5/8/2009
2		MSCI	0.00%	-1.79%	-7.36%	-10.46%	-18.22%	-5.84%	-1.34%	-0.02%	0.99%	2.66%	1.30%	4.70%	9.49%
3		MSCI	100.00%	98.21%	92.64%	89.54%	81.78%	94.16%	98.66%	99.98%	100.99%	102.66%	101.30%	104.70%	109.49%
4	1		100.00%	100.87%	97.11%	95.02%	93.46%	103.14%	107.54%	111.20%	112.37%	113.10%	113.07%	113.14%	117.39%
5	2		100.00%	96.99%	93.47%	93.24%	97.66%	86.09%	85.87%	87.02%	86.61%	85.52%	87.51%	90.14%	-25672593.76%
6	3		100.00%	96.63%	90.62%	86.94%	82.05%	92.52%	97.19%	99.43%	97.45%	97.71%	97.62%	97.48%	-259.70%
7	4		100.00%	97.45%	92.10%	90.83%	88.27%	93.72%	95.56%	101.07%	102.45%	103.91%	104.56%	106.41%	116.61%
8	5		100.00%	99.24%	97.96%	97.02%	94.23%	98.50%	99.64%	99.69%	99.36%	100.75%	100.64%	102.49%	107.83%
9	6		100.00%	98.80%	94.08%	91.53%	86.81%	93.63%	98.89%	102.26%	102.46%	105.02%	103.55%	105.71%	105.53%
10	7		100.00%	98.48%	91.39%	90.28%	88.86%	94.47%	99.58%	102.66%	104.63%	104.73%	104.79%	104.85%	107.78%
11	8		100.00%	99.72%	98.73%	97.54%	97.61%	98.91%	99.61%	100.39%	100.60%	101.43%	100.67%	102.24%	106.86%
12	9		100.00%	96.86%	87.50%	88.73%	85.82%	73.37%	69.23%	62.75%	64.16%	66.01%	89.31%	-153.85%	-13003.40%
13	10		100.00%	99.64%	98.24%	97.59%	98.09%	97.97%	98.09%	98.73%	98.79%	99.18%	99.01%	99.82%	-28.26%
14															
15	Ranking														
16	1			1	4	4	5	1	1	1	1	1	1	1	1
17	2			8	6	5	2	9	9	9	9	9	10	9	10
18	3			10	9	10	10	8	7	7	8	8	8	8	8
19	4			7	7	7	7	6	8	4	4	4	3	2	2
20	5			4	3	3	4	3	2	6	6	6	6	5	3
21	6			5	5	6	8	7	5	3	3	2	4	3	6
22	7			6	8	8	6	5	4	2	2	3	2	4	4
23	8			2	1	2	3	2	3	5	5	5	5	6	5
24	9			9	10	9	9	10	10	10	10	10	9	10	9
25	10			3	2	1	1	4	6	8	7	7	7	7	7
26	Submission					No submit	No change								Penalty
27	1		1	0	0	1	1	1	1	0	1	1	1	1	-1%
28	2		1	1	1	1	1	1	1	1	1	1	1	1	1
29	3		1	1	0	1	1	1	1	1	1	1	0	1	-1%
30	4		1	1	1	1	1	1	0	1	1	1	1	1	1
31	5		1	1	1	1	1	1	1	1	1	1	1	0	1
32	6		1	1	1	1	0	1	1	1	1	1	1	1	1
33	7		1	1	1	1	1	1	0	1	1	1	1	1	1
34	8		1	1	1	1	1	1	1	1	0	1	1	1	1
35	9		1	0	1	1	1	1	1	1	1	1	1	1	1
36	10		1	1	1	0	1	1	1	1	1	1	1	1	1
37	Bank balance		4,866.21	4,054.69	5,638.24	6,011.57	7,321.97	5,575.33	5,550.24	2,760.14	4,519.21	12,696.10	124,608	1,585,232,887	1,586,197,838
38	1		3,998.18	4,000.47	4,002.68	2,289.47	965.42	1,968.31	1,901.40	1,902.40	6,597.20	10,104.97	11,307.04	7,058.19	7,062.48
39	2		3,495.33	4,584.56	9,519.34	13,576.54	18,267.90	10,805.00	5,851.82	12,851.22	12,858.38	-9,859.65	-9,112.20	15,843,465,053	15,853,109,165
40	3		2,301.46	1,076.65	1,077.25	4,120.92	731.31	77.05	2,819.34	16,482.83	16,492.02	16,501.27	16,510.54	830,989.24	831,495.07
41	4		3,976.08	3,907.62	4,041.06	4,066.52	5,161.81	2,692.70	2,694.06	290.21	276.97	277.12	170.92	171.02	171.12
42	5		8,447.39	7,944.30	6,910.18	5,677.11	5,680.42	7,040.98	9,963.51	2,639.39	2,640.86	2,642.35	2,643.83	829.75	830.25
43	6		7,479.55	2,412.33	2,413.66	2,384.43	2,385.82	204.90	90.37	-2,881.33	-7,478.25	-7,580.31	1,992.32	10,994.50	11,001.19
44	7		2,002.71	41.88	5,951.88	1,998.83	2,000.00	38.55	38.57	-9,582.51	9,654.35	10,472.90	10,478.79	6,485.28	6,489.23
45	8		8,810.72	7,810.01	7,814.33	7,818.48	8,240.54	7,748.71	7,752.61	7,002.01	7,005.92	2,470.37	2,471.76	1,828.80	1,829.92
46	9		1,146.19	1,146.84	5,687.91	9,214.49	20,287.34	15,945.88	15,953.91	-9,212.52	-9,217.66	100,262.39	1,207,949	7,916,551.74	7,921,370.64
47	10		7,004.50	7,622.28	8,964.11	8,968.88	9,499.17	9,231.23	8,436.82	8,109.67	6,362.29	1,669.58	1,670.52	88,911.25	88,965.37

## Appendix A

A simulation game of foreign exchange trading and market index investing is designed to help participants to be familiar with foreign exchange and stock markets and apply financial principles to real-world situations.

- Each team starts the game with USD10 million. In April, additional USD10 million can be borrowed from the bank.
- Each index point costs USD1; e.g., ten shares of Dow Jones Industrial at 9,000 cost USD90,000
- <http://finance.yahoo.com/> is the sole source of trading information. The price information (an Excel worksheet) will be posted in Blackboard every Friday after 3 pm when the New York Stock Exchange closes.
- The portfolio adjustment is made once a week.
- There are no transactions cost.
- The game lasts 12 sessions from February 6 to May 1 (excluding the spring break).
- Any unused cash balance will be automatically deposited in the money-market instrument (in USD). Borrowing and lending rates are the same as the going market rate of the 10-year Treasury note.
- Two decimal points are used for the whole number as well as the percentage number; e.g., an index point of 4,905.21 and a bond yield of 4.58%.
- Each team can take a short-sale position of any index shares: any remaining uncovered short-sale position will be covered (i.e., bought back) weekly for portfolio valuation in the USD term (See the portfolio balance in USD in the excel worksheet).
- The information collected from the yahoo-finance webpage is used for portfolio adjustments. Any change in portfolio positions (hence updated worksheets) must be emailed to the professor by 6 p.m. each Saturday.
- Each team should send their current worksheet, which will be also used for verification. Each team should designate one member as a bookkeeper and communication contact. Even if there is no change in portfolio, it must be communicated to the professor. No submission indicates no change in portfolio. Any two non-submissions will cost one percentage point from the final portfolio performance.
- The portfolio performance is measured with the information as of 3 p.m. on May 8, 2009. All investments are converted to USD, and the USD period return is finally used for performance ranking.

- The 10 assigned percentage points are evaluated in two ways. First, the absolute performance is measured relative to MSCI index “The World Index in USD”. The weekly index information is also posted with other price information. The web address of MSCI is as follows: <http://www.msci.com/products/indices/stdindex/performance.jsp>. If the portfolio performance is at least as good as MSCI, 5 percentage points will be given; otherwise, 4 points will be assigned.
- Second, the relative performance is measured by return ranking, and the total of 50 points (5 points by 10 teams) will be distributed as follows: rank (points)  
1st (10), 2nd (8), 3rd (7), 4th (6), 5th (5), 6th (5), 7th (3), 8th (3), 9th (2), 10th (1)  
Thus, the simulation performance can range from 15 (= 5 + 10) points to 5 (= 4 + 1) points.

## Appendix B

Finance 4330

Group project (5 percentage points)

Topic: an economic analysis and its historical and future implications of the stock market

- ✓ Pick one stock market from the markets included in the simulation game.
- ✓ Conduct an economic analysis of a country where the chosen market resides in. See below some tips on economic analysis.
- ✓ Relate your findings from the economic analysis to the past development and future prospect of the stock market from a stock market investor's viewpoint.
- ✓ Other requirements

(1) Format: maximum 10 pages (the length is not an issue) including tables, figures and appendices; double-spaced; 11 or 12 font size

(2) Deadline: by 3/20

Tips on economic analysis:

- (1) A study of general economic conditions that is used in the valuation of common stock (in our case, the market itself)
- (2) Stock prices are positively related to the economy or economic conditions.
- (3) Economic measures and general effects on the stock market:

There are **economic factors** influencing the business cycle (hence the stock market) such as government fiscal policy (taxes, government spending, debt management), monetary policy (money supply, interest rates), other factors (inflation, consumer spending, business investments, foreign trade, currency exchange rates).

<b>Economic measures</b>	<b>What it tracks</b>		
Index of leading indicators	Future direction of GDP		
Personal income	Consumer buying habits		
Retail sales	Consumer attitudes		
Money supply	Growth of economy and inflation		
Consumer prices/Producer prices	Inflation		
Employment	Business production		
Housing starts	Availability and cost of money		

  

<b>Economic variables</b>	<b>+/-</b>	<b>Economic variables</b>	<b>+/-</b>
Gross Domestic Product	+	Interest rates	-
Industry Production	+	Money supply Moderate (Rapid)	+ ( - )
Inflation	-	Federal Budget Surplus	+
Corporate profits	+	Local currency	+ / -
Unemployment	-		