

## Assignment One:

It is Tuesday afternoon, February 14, 2012. Alexander Lucas, Assistant Treasurer at American Digital Graphics (ADG), sits in his office on the thirty-fourth floor of the building that dominates Rockefeller Plaza's west perimeter. It's Valentine's Day and Alexander and his wife have dinner reservations with another couple at Balthazar at 7:30.

"I must get this hedging memo done," thinks Lucas, "and get out of here. Foreign exchange options? I had better get the story straight before someone in the Finance Committee starts asking questions. Let's see, there are two ways in which I can envisage us using options now. One is to hedge a dividend due on September 15<sup>th</sup> from ADG Germany. The other is to hedge our upcoming payment to Matsumerda for their spring RAM chip statement. With the yen at 78 and increasing I'm glad we haven't covered the payment so far, but now I'm getting nervous and I would like to protect my posterior. An option to buy yen on June 10 might be just the thing.

Before we delve any further into Alexander Lucas's musings, let us learn a bit about ADG, and about foreign exchange options. American Digital Graphics is a \$12 billion sales company engaged in, among other things, the development, manufacture, and marketing of microprocessor-based equipment. Although 30 percent of the firm's sales are currently abroad, the firm has full-fledged manufacturing facilities in only three foreign countries, Germany, Canada, and Brazil. An assembly plant in Singapore exists primarily to solder Japanese semiconductor chips onto circuit boards and to screw these into Brazilian-made boxes for shipment to the United States, Canada, and Germany. The German subsidiary has developed half of its sales to France, the Netherlands, and the United Kingdom, billing in euros. ADG Germany has accumulated a cash reserve of €900,000, worth \$1,178,100 at today's exchange rate. The Hamburg office has automatic permission to repatriate €3 million September 15<sup>th</sup>. The firm has an agreement to buy three hundred thousand RAM chips at ¥8000 each semi-annually, and it is this payment that will fall due on June 10<sup>th</sup>.

Alexander Lucas in his Rockefeller Center office has been printing spot, forward and currency options and futures quotations from the company's Bloomberg terminal. (See the other pages for quotes and the highlighted market quotes.)

The option prices are quoted in U.S. cents per euro. Yen are quoted in hundredths of a cent. Looking at these prices, Richard realizes that he can work out how much the euro or yen would have to change to make the option worthwhile. Richard makes a mental note that ADG can typically borrow in the Eurocurrency market at LIBOR + 1% and lend at LIBID.

"I'll attach these numbers to my memo," mutters Lucas, but the truth is he has yet to come to grips with the real question, which is when, if ever, are currency options a better means of hedging exchange risk for an international firm than traditional forward exchange contracts or future's contracts. Please assist Mr. Lucas in his analysis of currency hedging for his report to ADG's Finance Committee.

HINT: Show which hedging is better (forward, money market or option). Why? Detail calculation and explanation required.

Currency Group		Key Cross Currency Rates – Majors									
02/14/12		Rate: Spot				Monitor: Last Price				Source: BGN	
		Bloomberg BGN(NY)									
	USD	EUR	JPY	GBP	CHF	CAD	AUD	NZD	HKD	NOK	SEK
SEK	6.7062	8.7768	.08545	10.500	7.2701	6.6934	7.1352	5.5546	.86496	1.1662	–
NOK	5.7505	7.5260	.07327	9.0038	6.2341	5.7396	6.1184	4.7631	.74170	–	.85749
HKD	7.7531	10.147	.09879	12.139	8.4052	7.7384	8.2492	6.4218	–	1.3483	1.1561
NZD	1.2073	1.5801	.01538	1.8903	1.3088	1.2050	1.2846	–	.15572	.20995	.18003
AUD	.93987	1.2301	.01198	1.4716	1.0189	.93809	–	.77848	.12122	.16344	.14015
CAD	1.0019	1.3113	.01277	1.5687	1.0862	–	1.0660	.82986	.12923	.17423	.14940
CHF	.92243	1.2072	.01175	1.4443	–	.92068	.98144	.76403	.11897	.16041	.13755
GBP	.63868	.83588	.00814	–	.69239	.63746	.67954	.52901	.08238	.11106	.09524
JPY	78.479	102.71	–	122.88	85.078	78.330	83.500	65.003	10.122	13.647	11.702
EUR	.76408	–	.00974	1.1963	.82834	.76263	.81296	.63288	.09855	.13287	.11394
USD	–	1.3088	.01274	1.5657	1.0841	.99810	1.0640	.82829	.12898	.17390	.14912

Currency Group		Key Cross Currency Rates – Majors									
02/14/12		Rate: 4 Month				Monitor: Outrights				Source: BGN	
		Bloomberg BGN(NY)									
	USD	EUR	JPY	GBP	CHF	CAD	AUD	NZD	HKD	NOK	SEK
SEK	6.7042	8.7760	.08542	10.497	7.2692	6.6924	7.1355	5.5526	.86471	1.1661	–
NOK	5.7494	7.5262	.07326	9.0022	6.2339	5.7393	6.1193	4.7618	.74156	–	.85758
HKD	7.7531	10.149	.09879	12.140	8.4065	7.7395	8.2520	6.4214	–	1.3485	1.1565
NZD	1.2074	1.5805	.01538	1.8905	1.3091	1.2053	1.2851	–	.15573	.21000	.18010
AUD	.93955	1.2299	.01197	1.4711	1.0187	.93790	–	.77816	.12118	.16342	.14014
CAD	1.0018	1.3113	.01276	1.5685	1.0862	–	1.0662	.82969	.12921	.17424	.14942
CHF	.92228	1.2073	.01175	1.4441	–	.92066	.98162	.76386	.11896	.16041	.13757
GBP	.63867	.83604	.00814	–	.69249	.63754	.67976	.52896	.08237	.11108	.09526
JPY	78.482	102.74	–	122.88	85.096	78.344	83.532	65.001	10.123	13.650	11.706
EUR	.76392	–	.00973	1.1961	.82830	.76258	.81307	.63270	.09853	.13287	.11395
USD	–	1.3090	.01274	1.5658	1.0843	.99824	1.0643	.82823	.12898	.17393	.14916

Currency Group		Key Cross Currency Rates – Majors									
02/14/12		Rate: 7 Month				Monitor: Outrights				Source: BGN	
		Bloomberg BGN(NY)									
	USD	EUR	JPY	GBP	CHF	CAD	AUD	NZD	HKD	NOK	SEK
SEK	6.7045	8.7761	.08543	10.497	7.2694	6.6926	7.1355	5.5528	.86472	1.1661	–
NOK	5.7495	7.5261	.07326	9.0021	6.2339	5.7394	6.1192	4.7619	.74155	–	.85757
HKD	7.7534	10.149	.09879	12.139	8.4066	7.7397	8.2518	6.4215	–	1.3485	1.1564
NZD	1.2074	1.5805	.01538	1.8904	1.3091	1.2053	1.2850	–	.15573	.21000	.18009
AUD	.93959	1.2299	.01197	1.4711	1.0188	.93794	–	.77820	.12119	.16342	.14014
CAD	1.0018	1.3113	.01276	1.5685	1.0862	–	1.0662	.82969	.12920	.17423	.14942
CHF	.92229	1.2073	.01175	1.4440	–	.92066	.98159	.76387	.11895	.16041	.13756
GBP	.63869	.83604	.00814	–	.69250	.63756	.67975	.52898	.08238	.11109	.09526
JPY	78.484	102.73	–	122.88	85.096	78.345	83.529	65.002	10.123	13.650	11.706
EUR	.76394	–	.00973	1.1961	.82831	.76260	.81306	.63272	.09853	.13287	.11395
USD	–	1.3090	.01274	1.5657	1.0843	.99824	1.0643	.82823	.12898	.17393	.14915

EURO MONEY RATES								
SECURITY	TIME	BID	ASK	CHANGE	HIGH	LOW	PRV CLS	
DEPOSIT RATES								
2) EUDR1T	-0/N	17:01	.1000	.3500	+.0750	.4500	.1450	.1500
3) EUDR2T	-T/N	13:59	.1500	.4000	—	.2800	.2250	.2750
4) EUDR3T	-S/N	20:00	.1500	.4000	+.0250	.3000	.1450	.2500
5) EUDR1Z	-1WK	12:32	.3200	.3700	+.0350	.4100	.3000	.3100
6) EUDR2Z	-2WK	20:00	.2500	.5000	—	.4450	.2200	.3750
7) EUDR3Z	-3WK	20:00	.3000	.5000	—	.5000	.2700	.4000
8) EUDRA	-1MO	16:23	.4500	.5700	-.0600	.7200	.5100	.5700
9) EUDRB	-2MO	20:00	.6000	.7200	—	.7100	.6550	.6600
10) EUDRC	-3MO	19:59	.9500	1.0000	—	1.1000	.9600	.9750
11) EUDRD	-4MO	19:59	1.0600	1.1100	-.0200	1.1550	1.0650	1.1050
12) EUDRE	-5MO	19:59	1.1800	1.2300	-.0100	1.3500	1.1700	1.2150
13) EUDRF	-6MO	19:59	1.2900	1.3400	-.0100	1.3700	1.3000	1.3250
14) EUDRG	-7MO	19:59	1.3500	1.4000	-.0100	1.4600	1.3650	1.3850
15) EUDRH	-8MO	19:59	1.4200	1.4700	-.0100	1.5250	1.4350	1.4550
16) EUDRI	-9MO	19:59	1.4800	1.5300	-.0100	1.6500	1.4900	1.5150
17) EUDRJ	-10MO	19:59	1.5400	1.5900	-.0100	1.6400	1.5650	1.5750
18) EUDRK	-11MO	19:59	1.5900	1.6500	-.0100	1.6950	1.5900	1.6300
19) EUDR1	-1YR	20:00	1.6500	1.7100	-.0100	1.8000	1.6500	1.6900

JAPANESE YEN MONEY RATES						
SECURITY	LAST	CHANGE	TIME	PREVIOUS	BID	ASK
DEPOSITS						
2) O/N	.0010	—	6:01	.0010	.0010	.0010
3) T/N	.0850	—	19:59	.0850	.0100	.1600
4) S/N	.1550	—	7:28	.1550	.0800	.2300
5) 1 Week	.1050	—	19:59	.1050	.0300	.1800
6) 2 Week	.1050	—	19:59	.1050	.0300	.1800
7) 3 Week	.1300	—	19:58	.1300	.0800	.1800
8) 1 Month	.1050	—	19:59	.1050	.0600	.1500
9) 2 Month	.1300	—	19:59	.1300	.1000	.1600
10) 3 Month	.1700	—	19:59	.1700	.1400	.2000
11) 4 Month	.2100	—	19:59	.2100	.1800	.2400
12) 5 Month	.2600	—	19:59	.2600	.2300	.2900
13) 6 Month	.3100	—	19:59	.3100	.2800	.3400
14) 7 Month	.3600	—	19:59	.3600	.3300	.3900
15) 8 Month	.4000	—	19:59	.4000	.3700	.4300
16) 9 Month	.4500	—	19:59	.4500	.4200	.4800
17) 10 Month	.4800	—	19:59	.4800	.4500	.5100
18) 11 Month	.5000	—	19:59	.5000	.4700	.5300
19) 1 Year	.5300	—	19:59	.5300	.5000	.5600

## USD MONEY MARKET RATES

SECURITY	TIME	BID	ASK	CHANGE	HIGH	LOW	PRV CLS
Fed Funds							
2) FDFD	15:49	.11000	.14000	—	.23000	.09000	.12000
Deposit Rates							
4) O/N	19:59	.0800	.1800	—	.2900	.1300	.1300
5) USD Depo T/N	14:23	.1300	.2000	-.0500	.2000	.1350	.2500
6) USD Depo S/N	20:00	.0800	.1800	—	.1600	.1300	.1300
7) USD Depo 1 WK	19:59	.1000	.2000	—	.2300	.1500	.1500
8) USD Depo 2 WK	20:00	.1200	.2200	—	.3000	.1690	.1700
9) USD Depo 3 WK	20:00	.1300	.2300	—	.2450	.1400	.1800
10) USD Depo 1 Mo	20:00	.1700	.2400	—	.3950	.2050	.2050
11) USD Depo 2 Mo	20:00	.3000	.3600	—	.8250	.2800	.3300
12) USD Depo 3 Mo	20:00	.4600	.5100	—	.8750	.3700	.4850
13) USD Depo 4 Mo	20:00	.5700	.6200	—	.7108	.5631	.5950
14) USD Depo 5 Mo	20:00	.6500	.7000	—	.7584	.6203	.6750
15) USD Depo 6 Mo	19:24	.7300	.7800	—	1.3550	.4550	.7550
16) USD Depo 7 Mo	20:03	.7800	.8300	-.0100	1.6300	.7351	1.6300
17) USD Depo 8 Mo	20:00	.8300	.8800	—	.9116	.7919	.8550
18) USD Depo 9 Mo	20:01	.8800	1.8300	-.3750	1.3550	.8548	1.7300
19) USD Depo 10 Mo	20:00	.9300	.9800	—	1.0771	.8706	.9550
20) USD Depo 11 Mo	20:00	.9900	1.0400	—	1.1213	.9222	1.0150

XEC Curncy		95) Templates							96) Actions		97) Expiry		Implied Vols (OMON)				
ECU SPOT USD STD		↑131.08 -.80 -.61%							/ Hi 131.80		Lo 131.80		HV 10.21 91) News				
Calc Mode		Center 131.00							Strike 5		Exch NASDAQ OM						
Calls									Puts								
Ticker	Bid	Ask	Last	IVM	DM	Volm	Qlnt	Strike	Ticker	Bid	Ask	Last	IVM	DM	Volm	Qlnt	
16 Jun 12 (123d); CSize 100; R 0.12									16 Jun 12 (123d); CSize 100; R 0.12								
11) XEM2C C	4.07	4.33	5.00y	12.03	.56	-	2	130	41) XEM2P C	3.10	3.27	3.10	12.25	-.44	10	953	
12) XEM2C C	3.79	4.02	-	11.91	.54	-	-	130.5	42) XEM2P C	3.32	3.47	5.18y	12.15	-.46	-	18	
13) XEM2C C	3.51	3.74	4.20y	11.83	.52	-	1	131	43) XEM2P C	3.55	3.69	3.56	12.06	-.48	1	346	
14) XEM2C C	3.25	3.47	-	11.73	.49	-	-	131.5	44) XEM2P C	3.78	3.92	4.94y	11.95	-.50	-	8	
15) XEM2C C	2.99	3.22	-	11.62	.47	-	-	135	45) XEM2P C	4.02	4.16	5.48y	11.85	-.53	-	7	
22 Sep 12 (221d); CSize 100; R 0.12									22 Sep 12 (221d); CSize 100; R 0.12								
16) XEU2C C	6.10	6.44	-	12.76	.58	-	-	129	46) XEU2P C	4.03	4.28	-	12.75	-.42	-	-	
17) XEU2C C	5.52	5.82	5.88y	12.58	.55	-	5	130	47) XEU2P C	4.44	4.67	4.69y	12.59	-.45	-	242	
18) XEU2C C	4.97	5.25	-	12.43	.52	-	-	131	48) XEU2P C	4.89	5.09	5.04y	12.43	-.48	-	35	
19) XEU2C C	4.45	4.73	-	12.31	.49	-	-	132	49) XEU2P C	5.35	5.56	7.00y	12.26	-.51	-	123	
20) XEU2C C	3.94	4.21	-	12.11	.46	-	-	133	50) XEU2P C	5.84	6.06	-	12.09	-.54	-	-	
22 Dec 12 (312d); CSize 100; R 0.12									22 Dec 12 (312d); CSize 100; R 0.12								
21) XEZ2C C	7.07	7.54	-	12.88	.58	-	-	129	51) XEZ2P C	4.95	5.44	-	12.97	-.42	-	-	
22) XEZ2C C	6.50	6.95	-	12.74	.55	-	-	130	52) XEZ2P C	5.37	5.82	5.55y	12.81	-.45	-	10	
23) XEZ2C C	5.96	6.38	-	12.62	.53	-	-	131	53) XEZ2P C	5.82	6.25	-	12.66	-.47	-	-	
24) XEZ2C C	5.44	5.85	-	12.48	.50	-	-	132	54) XEZ2P C	6.28	6.71	8.07y	12.51	-.50	-	5	
25) XEZ2C C	4.93	5.35	-	12.35	.47	-	-	133	55) XEZ2P C	6.76	7.20	-	12.37	-.53	-	-	
18 Feb 12 (4d); CSize 100; R 0.12									18 Feb 12 (4d); CSize 100; R 0.12								
26) XEG2C C	1.94	2.12	2.22	7.38	.98	1	1	129	56) XEG2P C	.10	.20	.25y	14.28	-.15	-	15	
27) XEG2C C	1.15	1.30	1.33	10.44	.76	1	5	130	57) XEG2P C	.25	.39	.21	13.18	-.20	1	162	

XEC Curncy		95) Templates							96) Actions		97) Expiry		Implied Vols (OMON)				
JAPAN ¥ SPOT USD STD		↑127.43 -1.48 -1.15%							/ Hi 128.20		Lo 127.33		HV 6.87 91) News				
Calc Mode		Center 127.41							Strike 5		Exch NASDAQ OM						
Calls									Puts								
Ticker	Bid	Ask	Last	IVM	DM	Volm	Qlnt	Strike	Ticker	Bid	Ask	Last	IVM	DM	Volm	Qlnt	
16 Jun 12 (123d); CSize 100; R 0.12									16 Jun 12 (123d); CSize 100; R 0.12								
1) XNM2C C	3.09	3.40	-	9.31	.57	-	-	126.5	31) XNM2P C	2.02	2.25	-	8.78	-.43	-	-	
2) XNM2C C	2.82	3.11	-	9.26	.54	-	-	127	32) XNM2P C	2.25	2.47	-	8.77	-.46	-	-	
3) XEM2C C	2.57	2.84	-	9.23	.51	-	-	127.5	33) XNM2P C	2.48	2.71	-	8.73	-.49	1	-	
4) XEM2C C	2.33	2.57	-	9.17	.48	-	-	128	34) XNM2P C	2.73	3.00	-	8.75	-.52	-	-	
5) XEM2C C	2.10	2.35	-	9.16	.45	-	-	128.5	35) XNM2P C	3.00	3.28	-	8.74	-.55	-	-	
22 Sep 12 (221d); CSize 100; R 0.12									22 Sep 12 (221d); CSize 100; R 0.12								
6) XNU2C C	5.22	5.74	-	10.51	.61	-	-	125	36) XNU2P C	2.47	2.85	3.10y	9.65	-.38	-	10	
7) XNU2C C	4.66	5.12	-	10.42	.57	-	-	126	37) XNU2P C	2.89	3.26	2.59y	9.61	-.42	-	10	
8) XNU2C C	4.14	4.55	-	10.36	.54	-	-	127	38) XNU2P C	3.35	3.69	-	9.54	-.46	-	-	
9) XNU2C C	3.67	4.02	-	10.32	.50	-	-	128	39) XNU2P C	3.85	4.24	-	9.57	-.51	-	-	
10) XNU2C C	3.20	3.58	-	10.30	.46	-	-	129	40) XNU2P C	4.40	4.80	-	9.57	-.55	-	-	
22 Dec 12 (312d); CSize 100; R 0.12									22 Dec 12 (312d); CSize 100; R 0.12								
11) XNZ2C C	6.29	6.90	-	11.24	.60	-	-	125	41) XNZ2P C	3.30	3.04	-	10.17	-.40	-	-	
12) XNZ2C C	5.73	6.29	-	11.17	.57	-	-	126	42) XNZ2P C	3.74	4.24	-	10.11	-.43	-	-	
13) XNZ2C C	5.21	5.74	-	11.09	.54	-	-	127	43) XNZ2P C	4.20	4.70	-	10.06	-.46	-	-	
14) XNZ2C C	4.74	5.24	-	11.08	.51	-	-	128	44) XNZ2P C	4.70	5.19	-	10.01	-.50	-	-	
15) XNZ2C C	4.28	4.77	-	11.05	.48	-	-	129	45) XNZ2P C	5.23	5.73	-	9.98	-.53	-	-	
18 Feb 12 (4d); CSize 100; R 0.12									18 Feb 12 (4d); CSize 100; R 0.12								
16) XNG2C C	2.34	2.60	-	12.79	.92	-	-	125	46) XNG2P C	-	.16	-	16.92	-.14	-	-	
17) XNG2C C	1.42	1.66	-	10.97	.84	-	-	126	47) XNG2P C	.01	.25	-	11.02	-.17	-	-	