Agios Pharmaceuticals

AG-221 Interim Phase 1 Data Robust and De-risking; Upgrading to Overweight

▲ Overweight
Previous: Neutral

AGIO, AGIO US
Price: $35.48

▲ Price Target: $55.00
Previous: $40.00

We are upgrading AGIO shares to Overweight from Neutral and increasing our Dec 2014 price target to $55 from $40. In our view, the interim phase 1 data presented at the AACR meeting yesterday were substantially de-risking for AG-221 (IDH2 program) and the broader technology platform, particularly for AG-120 (IDH1 program). Our prior Neutral rating on AGIO shares reflected a hesitation to ascribe a clinical stage valuation based on strong pre-clinical data. With robust interim phase 1 data on AG-221, however, the risk profile declines rather dramatically and the addressable markets are much more evaluable, which merits an Overweight rating, in our view. These AG-221 data are now the first clinical data to support what we had already considered to be very strong science at Agios; the fact that 6/7 evaluable patients achieved a clinical response, with the majority being complete responses, was well ahead of expectations. Indeed, physician commentary at AACR has been very encouraging. With no dose limiting toxicities (DLTs) reached yet, key questions will shift to duration of therapy, dosing regimen, next steps for the programs, and away from clinical proof-of-concept. In this note, we are introducing our AG-221 revenue models; we estimate that the agent could peak at $1B globally, which increases to $3B+ for the company's total oncology program (i.e., inclusion of AG-120).

- **Key takeaways from Agios analyst event:** Additional points on responses - The responses in the study were evaluated by investigators only, given in phase 1 trials robust responses are not expected. That said, it is likely that a centralized review will be part of the protocol in later assessments. It was also noted that in the 6 patients with responses, neutrophils normalized in all patients. Duration of therapy - Our sense is that in future cohorts the company will try to maximize duration of response, by enrolling patients that are not eligible for transplant or had received a prior transplant. Sepsis related death - We spoke to an investigator in the study who noted that sepsis / infection is a very common manifestation of acute leukemias. The investigator was not concerned about this AE in the study. IDH2 mutation prevalence - Lead investigator Dr. Eytan Stein (MSKCC) noted that with increased testing of IDH2 mutation, he expects the prevalence of the mutation to increase.

Biotechnology

Geoff Meacham AC
(1-212) 622-6531
geoffrey.c.meacham@jpmorgan.com
Bloomberg JPMA MEACHAM <GO>

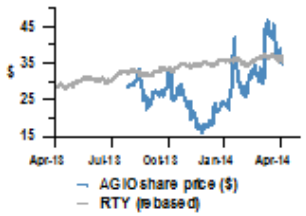
Anupam Rama
(1-212) 622-0105
anupam.rama@jpmorgan.com

Michael E Ulz
(1-212) 622-0900
michael.e.ulz@jpmorgan.com

Carter L Gould
(1-212) 622-4350
carter.l.gould@jpmorgan.com

J.P. Morgan Securities LLC

Price Performance



Agios Pharmaceuticals (AGIO;AGIO US)

FYE Dec	2013A	2014E	2015E
Analyst Adjusted Diluted EPS ($)			
Q1 (Mar)	(0.39)	(0.28)	-
Q2 (Jun)	(2.74)	(0.32)	-
Q3 (Sep)	(0.48)	(0.36)	-
Q4 (Dec)	(0.40)	(0.37)	-
FY	(2.83)	(1.33)	(0.51)

Source: Company data, Bloomberg, J.P. Morgan estimates.

Company Data	
Price ($)	35.48
Date Of Price	04 Apr 14
52-week Range ($)	49.79-15.77
Market Cap ($ mn)	1,105.31
Fiscal Year End	Dec
Shares O/S (mn)	31
Price Target ($)	55.00
Price Target End Date	31-Dec-14

See page 7 for analyst certification and important disclosures.

- **Efficacy:** As we had expected, there was rapid and robust inhibition of 2-HG in the phase 1 trials, which we believe would have established proof-of-concept alone. Indeed, there was pre-clinical data to support this. The major surprise in the study was the early clinical response rate, which beat expectations (6/7 patients with a clinical response). Indeed, responses occurred early in many patients (30mg BID dose: 1 CR and 1 CRp; 50mg BID: 2 CRs, 1 CPr, and 1 PR). Importantly, we note, both the lead investigator and the discussant of the study highlighted the R/R AML patients enrolled in the study would have had very poor outcomes with current standard of care.

- **Safety:** Overall, we do not have any major safety concerns. On the safety side, there has been no dose limited toxicities to date and AG-221 has been well-tolerated. As of March 20th, 22 patients have enrolled the study with 16 patients still on study. There were 4 deaths in the study and all were related to disease related sepsis and occurred in cycle 1 (3 in cohort 1 and 1 in cohort 4). Of note, Grade 2 AEs included hyperleukocytosis / differentiation syndrome, while Grade 3 AEs included confusion / respiratory failure due to sepsis.

- **Market estimates:** We are introducing our revenue builds for AG-221 and AG-120. We assume a price of $15k/cycle, which is slightly ahead of Pomalyst, and very conservatively assume duration of therapy between 8-10 cycles. Of note, we do not include AG-348 in PK Deficiency in our model. AG-221 – We assume a global launch in the 2017/2018 timeframe and that Celgene opts in upon MTD being established. We estimate peak AG-221 sales of $990M, with Agios receiving ~$150M in peak royalties (assume 15% royalty rate; see Table 1). AG-120 – Recall, Agios has already opted into US rights for AG-120 and we assume Celgene will opt into OUS rights. We assume a global launch in the 2018/2019 timeframe. We estimate peak AG-120 sales of $2.1B, with Agios retaining $950M at peak in the US, plus an additional ~$135M in royalties on OUS sales (assumes a 12.5% OUS royalty rate; see Table 2).

- **Valuation:** We are changing our valuation methodology for Agios from a comparable companies analysis to NPV / SOTP. We project sales for AG-221 and AG-120 through to 2027, assume no terminal value, and an 8% discount rate. We further assume a 70% probability of success for AG-221 and 50% for AG-120. We believe these estimates accurately reflect the data reported at AACR, the company's innovative science, with the relatively early stage of the company's pipeline. We derive a value of $7/sh for AG-221, $15/sh for the US rights to AG-120, and $3/sh for the OUS rights (assuming Celgene exercises its opt-in). These valuations, taken in combination with $26/sh for the technology platform and net cash of $4/sh, support our December 2014 PT of $55.

- **Upgrading to Overweight from Neutral.** Increasing December 2014 PT to $55 from $40.

Geoff Meacham
(1-212) 622-6531
geoffrey.c.meacham@jpmorgan.com

Table 1: AG-221 Revenue Build

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
AML and MPD population w/IDH2	9200	9292	9385	9479	9574	9669	9766	9864	9962	10062	10163
AG-221 penetration	5%	10%	20%	30%	35%	40%	45%	50%	55%	60%	65%
Total # of patients on therapy	460	929	1877	2844	3351	3868	4395	4932	5479	6037	6606
Price	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Cycles	10	10	10	10	10	10	10	10	10	10	10
Total cost	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
AG-221 Sales (in millions)	**$69**	**$139**	**$282**	**$427**	**$503**	**$580**	**$659**	**$740**	**$822**	**$906**	**$991**
Royalty to Agios	$10	$21	$42	$64	$75	$87	$99	$111	$123	$136	$149

Source: J.P. Morgan estimates.

Geoff Meacham
(1-212) 622-6531
geoffrey.c.meacham@jpmorgan.com

J.P.Morgan

Table 2: AG-120 Revenue Build

AG-120 (IDH1): Hematology
US / Eu / Japan IDH1 Populaton

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WW AML and MPD populaton w/IDH1	5600	5656	5713	5770	5827	5886	5945	6004	6064	6125	6186
WW% refractory	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
WW Addressable patient population	3360	3394	3428	3462	3496	3531	3567	3602	3638	3675	3712
US		1357	1371	1385	1399	1413	1427	1441	1455	1470	1485
AG-120 penetration		5%	10%	20%	30%	35%	40%	45%	50%	55%	60%
Total # of patients on therapy		68	343	692	1049	1236	1427	1621	1819	2021	2227
Price		$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Cycles		8	8	8	8	8	8	8	8	8	8
Total cost		$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000
US AG-120 Sales (in millions)		**$8**	**$41**	**$83**	**$126**	**$148**	**$171**	**$195**	**$218**	**$243**	**$267**
EU / Japan		2036	2057	2077	2098	2119	2140	2161	2183	2205	2227
AG-120 penetration			5%	10%	20%	30%	35%	40%	45%	50%	55%
Total # of patients on therapy			103	208	420	636	749	865	982	1102	1225
Price			$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Cycles			8	8	8	8	8	8	8	8	8
Total cost			$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000	$120,000
ROW AG-120 Sales (in millions)			**$12**	**$25**	**$50**	**$76**	**$90**	**$104**	**$118**	**$132**	**$147**
Royaly to Agios			**$2**	**$3**	**$6**	**$10**	**$11**	**$13**	**$15**	**$17**	**$18**
WW AG-120 Hematology Sales (in millions)		**$8**	**$53**	**$108**	**$176**	**$225**	**$261**	**$298**	**$336**	**$375**	**$414**
AG-120 Hematology Sales to Agios		**$8**	**$43**	**$86**	**$132**	**$158**	**$182**	**$207**	**$233**	**$259**	**$286**

AG-120 (IDH1): Solid Tumor
US / Eu / Japan IDH1 Populaton

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
WW Glioma w/IDH1	11000	11110	11221	11333	11447	11561	11677	11793	11911	12031	12151
WW Cholangiocarcinoma w/IDH1	1600	1616	1632	1648	1665	1682	1698	1715	1733	1750	1767
WW Chondrosarcoma w/IDH1	4600	4646	4692	4739	4787	4835	4883	4932	4981	5031	5081
WW Addressable populaton	17200	17372	17546	17721	17898	18077	18258	18441	18625	18811	19000
US		6949	7018	7088	7159	7231	7303	7376	7450	7525	7600
AG-120 penetration		5%	10%	20%	30%	35%	40%	45%	50%	55%	60%
Total # of patients on therapy		347	702	1418	2148	2531	2921	3319	3725	4139	4560
Price		$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Cycles		10	10	10	10	10	10	10	10	10	10
Total cost		$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
US AG-120 Sales (in millions)		**$52**	**$105**	**$213**	**$322**	**$380**	**$438**	**$498**	**$559**	**$621**	**$684**
EU / Japan			10527	10633	10739	10846	10955	11064	11175	11287	11400
AG-120 penetration			5%	10%	20%	30%	35%	40%	45%	50%	55%
Total # of patients on therapy			526	1063	2148	3254	3834	4426	5029	5643	6270
Price			$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000
Cycles			10	10	10	10	10	10	10	10	10
Total cost			$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000	$150,000
ROW AG-120 Sales (in millions)			**$79**	**$159**	**$322**	**$488**	**$575**	**$664**	**$754**	**$847**	**$940**
Royaly to Agios			**$10**	**$20**	**$40**	**$61**	**$72**	**$83**	**$94**	**$106**	**$118**
WW AG-120 Solid Tumor Sales (in millions)		**$52**	**$184**	**$372**	**$644**	**$868**	**$1,013**	**$1,162**	**$1,313**	**$1,467**	**$1,624**
Total AG-120 Solid Tumor Sales to Agios		**$52**	**$115**	**$233**	**$362**	**$441**	**$510**	**$581**	**$653**	**$727**	**$802**
Total AG-120 Sales (in millions)		**$60**	**$238**	**$480**	**$821**	**$1,092**	**$1,274**	**$1,460**	**$1,649**	**$1,842**	**$2,039**
Total AG-120 Cashflows to Agios (in millions)		**$60**	**$158**	**$319**	**$495**	**$598**	**$693**	**$788**	**$886**	**$986**	**$1,087**

Source: J.P. Morgan estimates.

Geoff Meacham
(1-212) 622-6531
geoffrey.c.meacham@jpmorgan.com

Investment Thesis, Valuation and Risks

Agios Pharmaceuticals *(Overweight; Price Target: $55.00)*

Investment Thesis

Agios's core science focuses on identifying drug targets in dysregulated metabolic pathways. In particular, with the use of high-throughput mass spectrometry and the "flux biochemistry" approach, many drug targets have been identified that modulate critical biological pathways. Indeed, the science appears very strong to us. The company's three lead assets are early stage: AG-221 (IDH2m inhibitor) and AG-120 (IDH1m inhibitor), both for oncology indications, and AG-348 (PKR activator), for an orphan disease known as pyruvate kinase deficiency. Importantly, positive early data at AACR 2014 for AG-221 de-risk not only this asset but also AG-120, as well as the broader technology platform, in our view. Our Overweight rating is based on strong science that has now been translated to the clinic.

Valuation

We are increasing our December 2014 price target to $55 from $40. Our $55 December 2014 price target for AGIO is based on our sum-of- the-parts analysis of AG-221, AG-120, the platform technology/IP and cash. We project sales for AG-221 and AG-120 through to 2027, assume no terminal value, and an 8% discount rate. We further assume a 70% probability of success for AG-221 and 50% for AG-120. We believe these estimates accurately reflect the data reported at AACR, the company's innovative science, with the relatively early stage of the company's pipeline. We derive a value of $7/sh for AG-221, $15/sh for the US rights to AG-120, and $3/sh for the OUS rights (assuming Celgene exercises its opt-in). These valuations, taken in combination with $26/sh for the technology platform and net cash of $4/sh, support our December 2014 PT of $55.

Risks to Rating and Price Target

Downside risks include 1) failure to show differentiated therapeutic benefit of lead assets or trial failure in later-stage trials (AG-221, AG-120, and AG-348), 2) FDA requires long development pathway, 3) while in the out-years, limited market uptake, and 4) out-year financing risk.

Geoff Meacham
(1-212) 622-6531
geoffrey.c.meacham@jpmorgan.com

J.P.Morgan

Agios Pharmaceuticals: Summary of Financials

Income Statement - Annual	FY13A	FY14E	FY15E	FY16E	Income Statement - Quarterly	1Q14E	2Q14E	3Q14E	4Q14E
Revenues	26	36	66	31	Revenues	9	9	9	9
Cost of products sold	0	0	0	0	Cost of products sold	0	0	0	0
Gross profit	-	-	-	-	Gross profit	-	-	-	-
SG&A	(10)	(13)	(13)	(14)	SG&A	(3)	(3)	(3)	(3)
R&D	(55)	(67)	(71)	(74)	R&D	(15)	(16)	(18)	(18)
Operating income	(39)	(44)	(18)	(57)	Operating income	(9)	(11)	(12)	(13)
EBITDA	(39)	(44)	(18)	(57)	EBITDA	(9)	(11)	(12)	(13)
Net interest (income) / expense	(4)	(0)	1	1	Net interest (income) / expense	0	0	(0)	(0)
Other income / (expense)	-	-	-	-	Other income / (expense)	-	-	-	-
Income taxes	0	0	0	0	Income taxes	0	0	0	0
Net income - GAAP	(42)	(45)	(18)	(56)	Net income - GAAP	(9)	(10)	(12)	(13)
Net income - recurring	(42)	(45)	(18)	(56)	Net income - recurring	(9)	(10)	(12)	(13)
Diluted shares outstanding	15	34	35	36	Diluted shares outstanding	32	33	34	35
EPS - excluding non-recurring	(2.83)	(1.33)	(0.51)	(1.57)	EPS - excluding non-recurring	(0.28)	(0.32)	(0.36)	(0.37)
EPS - recurring	(2.83)	(1.33)	(0.51)	(1.57)	EPS - recurring	(0.28)	(0.32)	(0.36)	(0.37)

Balance Sheet and Cash Flow Data	FY13A	FY14E	FY15E	FY16E	Ratio Analysis	FY13A	FY14E	FY15E	FY16E
Cash and cash equivalents	180	132	115	-	Sales growth	1.8%	39.1%	84.4%	(52.2%)
Accounts receivable	-	-	-	-	EBIT growth	69.1%	14.0%	(58.7%)	210.0%
Inventories	-	-	-	-	EPS growth - recurring	139.9%	(53.1%)	(61.6%)	208.7%
Other current assets	2	1	2	-					
Current assets	219	170	153	-	Gross margin	-	-	-	-
PP&E	4	4	5	-	EBIT margin	(152.2%)	(124.7%)	(27.9%)	(181.3%)
Total assets	226	174	158	-	EBITDA margin	(152.2%)	(124.7%)	(27.9%)	(181.3%)
					Tax rate	(0.9%)	0.0%	0.0%	0.0%
Total debt	-	-	-	-	Net margin	(166.1%)	(125.7%)	(27.0%)	(179.3%)
Total liabilities	93	88	88	-					
Shareholders' equity	133	86	70	-	Net Debt / EBITDA	-	-	-	-
					Net Debt / Capital (book)	-	-	-	-
Net income (including charges)	(42)	(45)	(18)	-					
D&A	1	1	2	-	Return on assets (ROA)	(23.3%)	(22.3%)	(10.6%)	(70.9%)
Change in working capital	0	(5)	0	-	Return on equity (ROE)	(47.9%)	(40.7%)	(22.6%)	(160.2%)
Other	8	1	1	-					
Cash flow from operations	(33)	(47)	(15)	-	Enterprise value / sales	-	-	-	-
					Enterprise value / EBITDA	-	-	-	-
Capex	(2)	(2)	(2)	-	Free cash flow yield	(5.8%)	(4.0%)	(1.4%)	(0.1%)
Free cash flow	(31)	(48)	(17)	(1)					
Cash flow from investing activities	122	(2)	(2)	-					
Cash flow from financing activities	0	0	0	-					
Dividends	-	-	-	-					
Dividend yield	-	-	-	-					

Source: Company reports and J.P. Morgan estimates.
Note: $ in millions (except per-share data).Fiscal year ends Dec

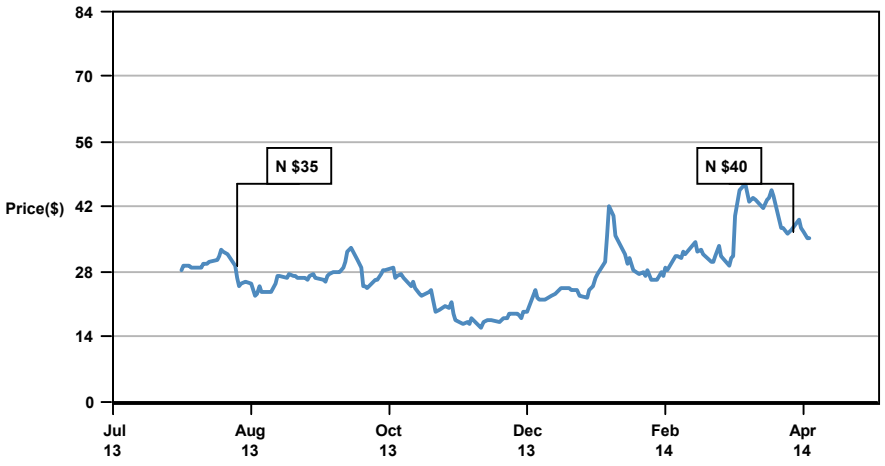
Analyst Certification: The research analyst(s) denoted by an "AC" on the cover of this report certifies (or, where multiple research analysts are primarily responsible for this report, the research analyst denoted by an "AC" on the cover or within the document individually certifies, with respect to each security or issuer that the research analyst covers in this research) that: (1) all of the views expressed in this report accurately reflect his or her personal views about any and all of the subject securities or issuers; and (2) no part of any of the research analyst's compensation was, is, or will be directly or indirectly related to the specific recommendations or views expressed by the research analyst(s) in this report. For all Korea-based research analysts listed on the front cover, they also certify, as per KOFIA requirements, that their analysis was made in good faith and that the views reflect their own opinion, without undue influence or intervention.

Important Disclosures

- **Market Maker:** JPMS makes a market in the stock of Agios Pharmaceuticals.
- **Lead or Co-manager:** J.P. Morgan acted as lead or co-manager in a public offering of equity and/or debt securities for Agios Pharmaceuticals within the past 12 months.
- **Client:** J.P. Morgan currently has, or had within the past 12 months, the following company(ies) as clients: Agios Pharmaceuticals.
- **Client/Investment Banking:** J.P. Morgan currently has, or had within the past 12 months, the following company(ies) as investment banking clients: Agios Pharmaceuticals.
- **Investment Banking (past 12 months):** J.P. Morgan received in the past 12 months compensation from investment banking Agios Pharmaceuticals.
- **Investment Banking (next 3 months):** J.P. Morgan expects to receive, or intends to seek, compensation for investment banking services in the next three months from Agios Pharmaceuticals.

Company-Specific Disclosures: Important disclosures, including price charts, are available for compendium reports and all J.P. Morgan–covered companies by visiting https://jpmm.com/research/disclosures, calling 1-800-477-0406, or e-mailing research.disclosure.inquiries@jpmorgan.com with your request. J.P. Morgan's Strategy, Technical, and Quantitative Research teams may screen companies not covered by J.P. Morgan. For important disclosures for these companies, please call 1-800-477-0406 or e-mail research.disclosure.inquiries@jpmorgan.com.

Agios Pharmaceuticals (AGIO, AGIO US) Price Chart



Date	Rating	Share Price ($)	Price Target ($)
19-Aug-13	N	29.11	35.00
28-Mar-14	N	36.56	40.00

Source: Bloomberg and J.P. Morgan; price data adjusted for stock splits and dividends.
Initiated coverage Aug 19, 2013.

The chart(s) show J.P. Morgan's continuing coverage of the stocks; the current analysts may or may not have covered it over the entire period.
J.P. Morgan ratings or designations: OW = Overweight, N= Neutral, UW = Underweight, NR = Not Rated

Explanation of Equity Research Ratings, Designations and Analyst(s) Coverage Universe:
J.P. Morgan uses the following rating system: Overweight [Over the next six to twelve months, we expect this stock will outperform the average total return of the stocks in the analyst's (or the analyst's team's) coverage universe.] Neutral [Over the next six to twelve months, we expect this stock will perform in line with the average total return of the stocks in the analyst's (or the analyst's team's)

coverage universe.] Underweight [Over the next six to twelve months, we expect this stock will underperform the average total return of the stocks in the analyst's (or the analyst's team's) coverage universe.] Not Rated (NR): J.P. Morgan has removed the rating and, if applicable, the price target, for this stock because of either a lack of a sufficient fundamental basis or for legal, regulatory or policy reasons. The previous rating and, if applicable, the price target, no longer should be relied upon. An NR designation is not a recommendation or a rating. In our Asia (ex-Australia) and U.K. small- and mid-cap equity research, each stock's expected total return is compared to the expected total return of a benchmark country market index, not to those analysts' coverage universe. If it does not appear in the Important Disclosures section of this report, the certifying analyst's coverage universe can be found on J.P. Morgan's research website, www.jpmorganmarkets.com.

Coverage Universe: Meacham, Geoffrey: AMAG Pharmaceuticals (AMAG), Acorda Therapeutics Inc. (ACOR), Agios Pharmaceuticals (AGIO), Alexion Pharmaceuticals (ALXN), Alnylam Pharmaceuticals (ALNY), Amgen Inc (AMGN), Biogen Idec (BIIB), Celgene (CELG), ChemoCentryx, Inc. (CCXI), Dynavax (DVAX), Enanta Pharmaceuticals (ENTA), Gilead Sciences (GILD), Idenix Pharmaceuticals (IDIX), InterMune (ITMN), Ironwood Pharmaceuticals (IRWD), Medivation (MDVN), Merrimack Pharmaceuticals (MACK), NPS Pharmaceuticals (NPSP), Ophthotech (OPHT), PTC Therapeutics (PTCT), Regeneron Pharmaceuticals (REGN), Synageva BioPharma (GEVA), United Therapeutics (UTHR), Vertex Pharmaceuticals (VRTX)

J.P. Morgan Equity Research Ratings Distribution, as of March 31, 2014

	Overweight (buy)	Neutral (hold)	Underweight (sell)
J.P. Morgan Global Equity Research Coverage	44%	44%	11%
IB clients*	58%	49%	40%
JPMS Equity Research Coverage	45%	48%	7%
IB clients*	78%	67%	60%

*Percentage of investment banking clients in each rating category.
For purposes only of FINRA/NYSE ratings distribution rules, our Overweight rating falls into a buy rating category; our Neutral rating falls into a hold rating category; and our Underweight rating falls into a sell rating category. Please note that stocks with an NR designation are not included in the table above.

Equity Valuation and Risks: For valuation methodology and risks associated with covered companies or price targets for covered companies, please see the most recent company-specific research report at http://www.jpmorganmarkets.com, contact the primary analyst or your J.P. Morgan representative, or email research.disclosure.inquiries@jpmorgan.com.

Equity Analysts' Compensation: The equity research analysts responsible for the preparation of this report receive compensation based upon various factors, including the quality and accuracy of research, client feedback, competitive factors, and overall firm revenues.

Other Disclosures

J.P. Morgan ("JPM") is the global brand name for J.P. Morgan Securities LLC ("JPMS") and its affiliates worldwide. J.P. Morgan Cazenove is a marketing name for the U.K. investment banking businesses and EMEA cash equities and equity research businesses of JPMorgan Chase & Co. and its subsidiaries.

All research reports made available to clients are simultaneously available on our client website, J.P. Morgan Markets. Not all research content is redistributed, e-mailed or made available to third-party aggregators. For all research reports available on a particular stock, please contact your sales representative.

Options related research: If the information contained herein regards options related research, such information is available only to persons who have received the proper option risk disclosure documents. For a copy of the Option Clearing Corporation's Characteristics and Risks of Standardized Options, please contact your J.P. Morgan Representative or visit the OCC's website at http://www.optionsclearing.com/publications/risks/riskstoc.pdf

Legal Entities Disclosures
U.S.: JPMS is a member of NYSE, FINRA, SIPC and the NFA. JPMorgan Chase Bank, N.A. is a member of FDIC. **U.K.**: JPMorgan Chase N.A., London Branch, is authorised by the Prudential Regulation Authority and is subject to regulation by the Financial Conduct Authority and to limited regulation by the Prudential Regulation Authority. Details about the extent of our regulation by the Prudential Regulation Authority are available from J.P. Morgan on request. J.P. Morgan Securities plc (JPMS plc) is a member of the London Stock Exchange and is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. Registered in England & Wales No. 2711006. Registered Office 25 Bank Street, London, E14 5JP. **South Africa**: J.P. Morgan Equities South Africa Proprietary Limited is a member of the Johannesburg Securities Exchange and is regulated by the Financial Services Board. **Hong Kong**: J.P. Morgan Securities (Asia Pacific) Limited (CE number AAJ321) is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission in Hong Kong and/or J.P. Morgan Broking (Hong Kong) Limited (CE number AAB027) is regulated by the Securities and Futures Commission in Hong Kong. **Korea**: J.P. Morgan Securities (Far East) Ltd, Seoul Branch, is regulated by the Korea Financial Supervisory Service. **Australia**: J.P. Morgan Australia Limited (JPMAL) (ABN 52 002 888 011/AFS Licence No: 238188) is regulated by ASIC and J.P. Morgan Securities Australia Limited (JPMSAL) (ABN 61 003 245 234/AFS Licence No: 238066) is regulated by ASIC and is a Market, Clearing and Settlement Participant of ASX Limited and CHI-X. **Taiwan**: J.P.Morgan Securities (Taiwan) Limited is a participant of the Taiwan Stock Exchange (company-type) and regulated by the Taiwan Securities and Futures Bureau. **India**: J.P. Morgan India Private Limited, having its registered office at J.P. Morgan Tower, Off. C.S.T. Road, Kalina, Santacruz East, Mumbai - 400098, is a member of the National Stock Exchange of India Limited (SEBI Registration Number - INB 230675231/INF 230675231/INE 230675231) and Bombay Stock Exchange Limited (SEBI

Registration Number - INB 010675237/INF 010675237) and is regulated by Securities and Exchange Board of India. For non local research reports, this material is not distributed in India by J.P. Morgan India Private Limited. **Thailand**: This material is issued and distributed in Thailand by JPMorgan Securities (Thailand) Ltd., which is a member of the Stock Exchange of Thailand and is regulated by the Ministry of Finance and the Securities and Exchange Commission and its registered address is 3rd Floor, 20 North Sathorn Road, Silom, Bangrak, Bangkok 10500. **Indonesia**: PT J.P. Morgan Securities Indonesia is a member of the Indonesia Stock Exchange and is regulated by the OJK a.k.a. BAPEPAM LK. **Philippines**: J.P. Morgan Securities Philippines Inc. is a Trading Participant of the Philippine Stock Exchange and a member of the Securities Clearing Corporation of the Philippines and the Securities Investor Protection Fund. It is regulated by the Securities and Exchange Commission. **Brazil**: Banco J.P. Morgan S.A. is regulated by the Comissao de Valores Mobiliarios (CVM) and by the Central Bank of Brazil. **Mexico**: J.P. Morgan Casa de Bolsa, S.A. de C.V., J.P. Morgan Grupo Financiero is a member of the Mexican Stock Exchange and authorized to act as a broker dealer by the National Banking and Securities Exchange Commission. **Singapore**: This material is issued and distributed in Singapore by or through J.P. Morgan Securities Singapore Private Limited (JPMSS) [MCI (P) 199/03/2014 and Co. Reg. No.: 199405335R] which is a member of the Singapore Exchange Securities Trading Limited and is regulated by the Monetary Authority of Singapore (MAS) and/or JPMorgan Chase Bank, N.A., Singapore branch (JPMCB Singapore) which is regulated by the MAS. This material is provided in Singapore only to accredited investors, expert investors and institutional investors, as defined in Section 4A of the Securities and Futures Act, Cap. 289. Recipients of this document are to contact JPMSS or JPMCB Singapore in respect of any matters arising from, or in connection with, the document. **Japan**: JPMorgan Securities Japan Co., Ltd. is regulated by the Financial Services Agency in Japan. **Malaysia**: This material is issued and distributed in Malaysia by JPMorgan Securities (Malaysia) Sdn Bhd (18146-X) which is a Participating Organization of Bursa Malaysia Berhad and a holder of Capital Markets Services License issued by the Securities Commission in Malaysia. **Pakistan**: J. P. Morgan Pakistan Broking (Pvt.) Ltd is a member of the Karachi Stock Exchange and regulated by the Securities and Exchange Commission of Pakistan. **Saudi Arabia**: J.P. Morgan Saudi Arabia Ltd. is authorized by the Capital Market Authority of the Kingdom of Saudi Arabia (CMA) to carry out dealing as an agent, arranging, advising and custody, with respect to securities business under licence number 35-07079 and its registered address is at 8th Floor, Al-Faisaliyah Tower, King Fahad Road, P.O. Box 51907, Riyadh 11553, Kingdom of Saudi Arabia. **Dubai**: JPMorgan Chase Bank, N.A., Dubai Branch is regulated by the Dubai Financial Services Authority (DFSA) and its registered address is Dubai International Financial Centre - Building 3, Level 7, PO Box 506551, Dubai, UAE.

Country and Region Specific Disclosures
U.K. and European Economic Area (EEA): Unless specified to the contrary, issued and approved for distribution in the U.K. and the EEA by JPMS plc. Investment research issued by JPMS plc has been prepared in accordance with JPMS plc's policies for managing conflicts of interest arising as a result of publication and distribution of investment research. Many European regulators require a firm to establish, implement and maintain such a policy. This report has been issued in the U.K. only to persons of a kind described in Article 19 (5), 38, 47 and 49 of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (all such persons being referred to as "relevant persons"). This document must not be acted on or relied on by persons who are not relevant persons. Any investment or investment activity to which this document relates is only available to relevant persons and will be engaged in only with relevant persons. In other EEA countries, the report has been issued to persons regarded as professional investors (or equivalent) in their home jurisdiction. **Australia:** This material is issued and distributed by JPMSAL in Australia to "wholesale clients" only. This material does not take into account the specific investment objectives, financial situation or particular needs of the recipient. The recipient of this material must not distribute it to any third party or outside Australia without the prior written consent of JPMSAL. For the purposes of this paragraph the term "wholesale client" has the meaning given in section 761G of the Corporations Act 2001. **Germany:** This material is distributed in Germany by J.P. Morgan Securities plc, Frankfurt Branch and J.P.Morgan Chase Bank, N.A., Frankfurt Branch which are regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht. **Hong Kong:** The 1% ownership disclosure as of the previous month end satisfies the requirements under Paragraph 16.5(a) of the Hong Kong Code of Conduct for Persons Licensed by or Registered with the Securities and Futures Commission. (For research published within the first ten days of the month, the disclosure may be based on the month end data from two months prior.) J.P. Morgan Broking (Hong Kong) Limited is the liquidity provider/market maker for derivative warrants, callable bull bear contracts and stock options listed on the Stock Exchange of Hong Kong Limited. An updated list can be found on HKEx website: http://www.hkex.com.hk. **Japan:** There is a risk that a loss may occur due to a change in the price of the shares in the case of share trading, and that a loss may occur due to the exchange rate in the case of foreign share trading. In the case of share trading, JPMorgan Securities Japan Co., Ltd., will be receiving a brokerage fee and consumption tax (shouhizei) calculated by multiplying the executed price by the commission rate which was individually agreed between JPMorgan Securities Japan Co., Ltd., and the customer in advance. Financial Instruments Firms: JPMorgan Securities Japan Co., Ltd., Kanto Local Finance Bureau (kinsho) No. 82 Participating Association / Japan Securities Dealers Association, The Financial Futures Association of Japan, Type II Financial Instruments Firms Association and Japan Investment Advisers Association. **Korea:** This report may have been edited or contributed to from time to time by affiliates of J.P. Morgan Securities (Far East) Ltd, Seoul Branch. **Singapore:** JPMSS and/or its affiliates may have a holding in any of the securities discussed in this report; for securities where the holding is 1% or greater, the specific holding is disclosed in the Important Disclosures section above. **India:** For private circulation only, not for sale. **Pakistan:** For private circulation only, not for sale. **New Zealand:** This material is issued and distributed by JPMSAL in New Zealand only to persons whose principal business is the investment of money or who, in the course of and for the purposes of their business, habitually invest money. JPMSAL does not issue or distribute this material to members of "the public" as determined in accordance with section 3 of the Securities Act 1978. The recipient of this material must not distribute it to any third party or outside New Zealand without the prior written consent of JPMSAL. **Canada:** The information contained herein is not, and under no circumstances is to be construed as, a prospectus, an advertisement, a public offering, an offer to sell securities described herein, or solicitation of an offer to buy securities described herein, in Canada or any province or territory thereof. Any offer or sale of the securities described herein in Canada will be made only under an exemption from the requirements to file a prospectus with the relevant Canadian securities regulators and only by a dealer properly registered under applicable securities laws or, alternatively, pursuant to an exemption from the dealer registration requirement in the relevant province or territory of Canada in which such offer or sale is made. The information contained herein is under no circumstances to be construed as investment advice in any province or territory of Canada and is not tailored to the needs of the recipient. To the extent that the information contained herein references securities of an issuer incorporated, formed or created under the laws of Canada or a province or territory of Canada, any trades in such securities must be conducted through a dealer registered in Canada. No securities commission or similar regulatory authority in Canada has reviewed or in any way passed judgment upon these materials, the information contained herein or the merits of the securities described herein, and any representation to the contrary is an offence. **Dubai:** This report has been issued to persons regarded as professional clients as defined under the DFSA rules. **Brazil**: Ombudsman J.P. Morgan: 0800-7700847 / ouvidoria.jp.morgan@jpmorgan.com.

General: Additional information is available upon request. Information has been obtained from sources believed to be reliable but JPMorgan Chase & Co. or its affiliates and/or subsidiaries (collectively J.P. Morgan) do not warrant its completeness or accuracy except with respect to any disclosures relative to JPMS and/or its affiliates and the analyst's involvement with the issuer that is the subject of the research. All pricing is as of the close of market for the securities discussed, unless otherwise stated. Opinions and estimates constitute our judgment as of the date of this material and are subject to change

without notice. Past performance is not indicative of future results. This material is not intended as an offer or solicitation for the purchase or sale of any financial instrument. The opinions and recommendations herein do not take into account individual client circumstances, objectives, or needs and are not intended as recommendations of particular securities, financial instruments or strategies to particular clients. The recipient of this report must make its own independent decisions regarding any securities or financial instruments mentioned herein. JPMS distributes in the U.S. research published by non-U.S. affiliates and accepts responsibility for its contents. Periodic updates may be provided on companies/industries based on company specific developments or announcements, market conditions or any other publicly available information. Clients should contact analysts and execute transactions through a J.P. Morgan subsidiary or affiliate in their home jurisdiction unless governing law permits otherwise.

"Other Disclosures" last revised April 5, 2014.