# Conatus Pharmaceuticals Inc.

August 19, 2013

## *Attractive Opportunity in Orphan Liver Disease, Initiate with Buy*

**Initiating Coverage of CNAT with a Buy & $17PT**. CNAT's 1st-in-class oral caspase protease inhibitor, emricasan, presents an attractive oppy in treating liver disease & fibrosis. CNAT has multiple shots at securing regulatory approval for emricasan in 3 orphan liver diseases & substantial operating leverage from a commercial model that requires only 16/12 reps to cover >90% of US/EU liver transplant centers. Our DCF suggests an intrinsic value of $17/share through the 2027/2028 EU/US exclusivity period, which excludes patent term extension. Upside is attractive; with the bulk of CNAT's intrinsic value dependent on out year cash flows & terminal value & use of existing/anticipated NOLs to offset future tax expenses starting in 2018.

**Emricasan Targets a High Unmet Need in Liver Disease –** Recently presented pre-clinical studies show promising histological results with reduced inflammation & cell death that slows disease progression to fibrosis & cirrhosis/decompensation. This data supports CNAT's Ph-II/III development for 3 orphan indications in the US/EU: chronic liver failure (CLF), acute-on-chronic liver failure (ACLF), & Hepatitis C virus-related post-orthotopic liver transplant (HCV-POLT).

**Liver Disease is an Attractive Market Oppy -** Our emricasan sales forecasts & DCF assume only a 15% probability of success with '17E sales of $6M approaching $430M in 2028E (vs. $3B un-risk adjusted sales by 2028E). Our model assumes initial EU launches in CLF & ACLF in '17E & HCV-POLT in '18E. In the US, we assume a CLF launch in '18E, ACLF in '19E & HCV-POLT in '20E.

**CLF, ACLF & HCV-POLT Represent Attractive Markets –** Higher penetration rates, pricing & duration of therapy assumptions would add materially to our un-risk adjusted sales of $3B by '28E. Our patient driven EU & US market model assume CLF, ACLF & HCV-POLT represent 10K, 150K and 50K patients, respectively. We see upside to our conservative emricasan model assumptions for penetration rates (40-60% assumed), US/EU pricing ($10K per month / $7K per month) & duration of therapy for CLF (1.0 to 1.6 months vs. up to 3 months in the label), ACLF (1.5 months vs. up to 6 months) & HCV-POLT (12 months vs. 24 months to life treatment).

**Emricasan Has An Attractive Patent Estate –** Our model assumes CNAT's polymorph composition of matter (COM) patents expiring in 2027 (EU)/2028 (US) providing protection from generic entry. This excludes any patent term US Hatch-Waxman or EU extensions, which could add up to five years to of additional exclusivity.

**Catalysts –** 1) Initiation of a Phase IIb ACLF trial and Phase IIb/III HCV-POLT trial in 2H13, 2) clinical trial design meeting by the FDA/AASLD on September 5th & 6th, 3) end of Phase II meeting with FDA to define the US clinical development plan, 4) filing for Orphan Drug designation, 5) present Phase IIb ACLF results at the Apr. '14 EASL or Nov. '14 AASLD meetings which provide further clarity on the biomarkers (cCK-18 & ALT) and their clinical utility.

| FYE – Dec. | 2012A | 2013E | | 2014E | |
|---|---|---|---|---|---|
| **EPS** | **Current** | **Previous** | **Current** | **Previous** | **Current** |
| 1Q | -$0.21A | NA | -$0.25A | NA | -$0.34E |
| 2Q | NA | NA | -$0.22E | NA | -$0.37E |
| 3Q | NA | NA | -$0.18E | NA | -$0.43E |
| 4Q | NA | NA | -$0.25E | NA | -$0.42E |
| **Year** | -$0.95A | NA | -$0.88E | NA | -$1.54E |
| P/E | -9.8x | | -10.6x | | -6.0x |
| Mean EPS Estimate | -$0.95 | | NA | | NA |
| **Revenue (mil.)** | **Current** | **Previous** | **Current** | **Previous** | **Current** |
| 1Q | $0.0A | NA | $0.0A | NA | $0.0E |
| 2Q | $0.0A | NA | $0.0E | NA | $0.0E |
| 3Q | $0.0A | NA | $0.0E | NA | $0.0E |
| 4Q | $0.0A | NA | $0.0E | NA | $0.0E |
| **Year** | $0.0A | NA | $0.0E | NA | $0.0E |
| EV/EBITDA | NA | | NA | | NA |
| Operating Margin | NA | NA | NA | NA | NA |

**CNAT**

| | |
|---|---|
| Price (Aug. 16, 2013) | $9.29 |
| Mkt. Cap. (mil.) | $153.1 |

**Pharmaceuticals**

| | |
|---|---|
| Rating: | **Buy** |
| *Previous:* | *NA* |
| Price Target: | **$17.00** |
| *Previous:* | *NA* |
| Risk Rank: | **High** |
| *Previous:* | *NA* |
| Sector Rating: | **Market Weight** |

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| Market Data: | |
|---|---|
| 52-Week Range | $9.62-$8.91 |
| Shares Out. (mil.) | 16.5 |
| Float (mil.) | NA |
| Avg. Daily Vol. (000) | 250 |
| Dividend/Yield | $0.00/0.0% |

| Financial Highlights: | |
|---|---|
| Long-Term Debt (mil.) | $1.0 |
| Debt/Cap. | 1.4% |
| Debt/EBITDA | NA |
| ROE | -30.3% |
| Book Value/Share | $5.54 |
| Free Cash Flow/Share | -$0.56 |
| Net Cash/Share | $5.45 |
| Shareholders' Equity (mil.) | $68.9 |
| Est. 5-Year EPS Growth | 1% |
| Convertible | No |
| Key Indices | RUT |

| EPS Est. Changes | 2013 | 2014 |
|---|---|---|
| NA | NA | NA |
| NA | NA | NA |
| NA | NA | NA |

PLEASE SEE IMPORTANT DISCLOSURES STARTING ON PAGE 30

## Comments

**Investment Thesis**

We are initiating coverage of Conatus Pharmaceuticals (CNAT) with a Buy rating and $17 price target given its attractive risk-reward based on our conservative revenue and DCF assumptions. Our valuation analysis applies a significant discount rate appropriate for early clinical-stage companies to our heavily risk adjusted revenue and cash flow estimates, which suggests that CNAT's shares are undervalued. We view CNAT as a pioneer in the development of its 1st-in-class oral caspase protease inhibitor, emricasan, for treating liver disease & fibrosis. We view the clinical development and regulatory risks as high due to the challenging patient population. CNAT has attempted to minimize this risk through the favorable histological data that it has presented and pre-clinical studies that have had some conflicting results in key biomarkers for cell death and inflammation. On the regulatory front, there is uncertainty on the use of surrogate endpoints in liver disease clinical trials and their potential clinical utility in a patient population that frequently has other co-morbidities and high mortality rates. In Europe, regulators have expressed greater acceptance of surrogate endpoints in orphan liver trials, while in the US Conatus remains in ongoing discussions with the FDA regarding clinical trial design for emricasan. Our model assumes initial EU launches in chronic liver failure (CLF) & acute-on-chronic liver failure (ACLF) in 2017E, & Hepatitis C virus-related post-orthotopic liver transplant (HCV-POLT) in 2018E. In the US, we assume a CLF launch in 2018E, ACLF in 2019E & HCV-POLT in 2020E. However, given that lack of a clear pathway to US approval, Conatus could potentially be required to conduct additional trials which would not only result in longer timelines than we have modeled but also greater capital requirements. We view the commercial risk as low and offering a high degree of operating leverage since only 16/12 US/EU sales representatives would be needed to cover >90% of the liver transplant centers. In addition, the three potential orphan disease populations targeted have a high unmet medical need and represent a large market opportunity through the US/EU exclusivity periods of 2028/2027 withstanding any patent challenges and excluding any extensions. If Conatus is able to navigate the clinical and regulatory risks for emricasan, our 15 % risk adjustment to our $430M revenue assumption in 2028E could prove to be overly conservative. Consequently, any upward revision to our sales forecast would have material upside to Conatus's earnings power as well as its intrinsic value.

**Valuation Summary**

Conatus is a clinical stage company unlikely to achieve either revenues or profitability until the latter part of the decade, so we primarily value the company using a discounted cash flow (DCF) analysis. Also, the paucity of 2018+ consensus revenue and profitability estimates for most clinical stage and orphan disease companies makes valuing CNAT shares difficult; hence we do not include a peer group comparison in our valuation analysis. In our DCF we apply an estimated WACC of 16.7% and terminal growth rate of 1.0% to Conatus's projected free cash flows from the present through its 2028 exclusivity period. The present value of Conatus's 2013E-2028E cash flows are approximately $140 million and the present value of its estimated terminal value is $105 million. Adjusted for its average 2012A/2013E net cash position, our discounted cash flow valuation analysis of CNAT shares suggests an intrinsic value of approximately $17 per share. We have also tested our DCF assumptions below by varying our estimated WACC and terminal growth rates in 50 basis points (bps) increments. Each 50 bps deviation from our WACC changes the intrinsic value by approximately 8%, whereas each 50 bps increment in the assumed terminal growth rate changes the intrinsic value by approximately 2%.

We would note that a significant portion of our estimate is derived from: 1) projected cash flows for 2018E and beyond which is the earliest timeframe that we forecast Conatus to become cash flow positive, and 2) the estimated present value of terminal value accounts for a large portion of our intrinsic value. Our model also assumes that Conatus will utilize its existing $105M and anticipated net operating losses (NOLs) to offset future tax expenses. Additionally, the projected cash flows in our model could differ materially from our estimate should Conatus fail to garner initial EU and US approval or other subsequent indications for emricasan.

**Catalyst Calendar**

We anticipate that the next 12-18 months will be highly eventful for Conatus as several key events are expected to occur. We catalog CNAT's upcoming events and provide some brief context on events that could potentially move CNAT shares.

**Exhibit 1: Conatus Pharmaceuticals Inc. - Upcoming Events**

| Event | Expected |
|---|---|
| FDA/AASLD Workshop | Sept. 5-6, 2013 |
| Initiate Phase IIb study, ACLF (UK Sites) | 2H13 |
| Initiate Phase IIb/III* study, HCV-POLT | 2H13 |
| File for Orphan Drug Designation, ACLF, US and EU | 2H13 |
| Top-line data, phase IIb trial, ACLF | 1H14 |
| End of phase IIb meeting, ACLF, US and EU | 2H14 |
| Initiate Phase IIb study, CLF | 2H14 |
| Initiate Phase III study, ACLF (International Sites) | 1H15 |
| Top-line data, phase IIb trial, CLF | 2H15 |

*Phase IIb in the US and Phase III in EU.

Source: STRH estimates, company reports, www.FDA.gov, EASL & AASLD

**FDA/AASLD Workshop on Clinical Trial Design for Liver Disease**

On September 5th and 6th, 2013, the FDA and the American Association for Study of Liver Disease (AASLD) are scheduled to conduct a jointly sponsored workshop on clinical trial design for nonalcoholic fatty liver disease (NAFLD) and its related complications of nonalcoholic steatohepatitis (NASH) and fibrosis/cirrhosis. We view this as a key event as it will provide insight into the agency's perspective on using surrogate (i.e., biomarker and histological endpoint) as well as clinical endpoints in certain types of liver disease trials, which could potentially have implications for a subset (and possibly larger portion) of the patient population that Conatus is targeting through its Phase II/III clinical development program.

**Phase IIb Clinical Trial for ACLF**

Conatus is expected to initiate a Phase IIb trial of emricasan in ACLF in 2H13. This Phase IIb study is expected to take 3 to 6 months following enrollment with top-line results expected in 1H14, possibly in time for presentation at EASL (April 2014 in London) or alternatively at AASLD (Nov. 2014 in Boston). Positive data from the trial could be an important catalyst for CNAT shares as the results may increase confidence in the acceptance by the FDA of ACLF as an indication. Moreover, the secondary endpoint of time to clinical worsening (TTCW) may also provide insight into the clinical relevancy of biomarkers ahead of a Phase III trial that would potentially use TTCW as a primary endpoint and relegate biomarkers (cCK-18 maker of excessive liver cell death [apoptosis] & alanine aminotransferase [ALT] which is an enzyme produced in the liver cells that is marker for severity of liver inflammation) as secondary endpoints.

**Phase IIb/III Clinical Trial for HCV-POLT**

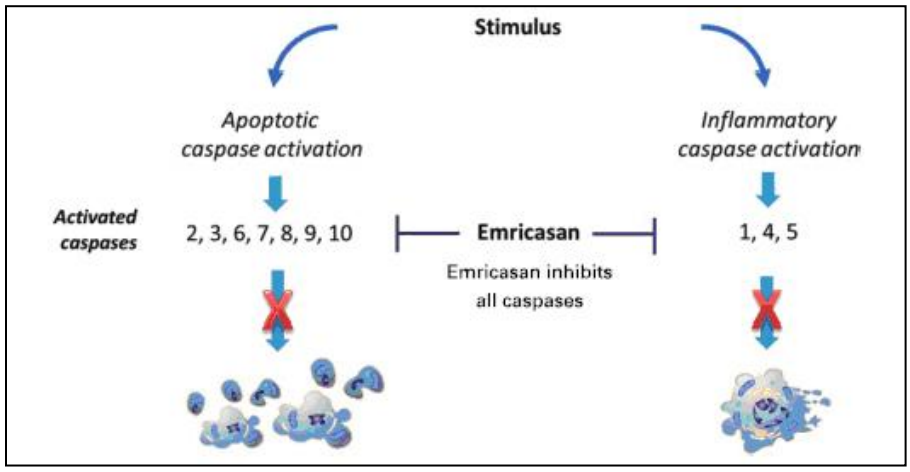
Another key event in 2H13 is the initiation of the Phase IIb/III trial of emricasan in HCV-POLT. Although we believe this event is not necessarily stock-moving given the 2-year study timeframe, it would begin the company's most advanced stage of clinical testing of emricasan in a Phase III study in the EU.

## Emricasan: Background

### Mechanism of Action

Emricasan is a pan-caspase inhibitor (PCI), believed to function by inhibiting caspase activity thereby reducing apoptosis (programmed cell death) and inflammation in diseased livers (See Exhibit 2). In healthy humans, caspases are normally involved in the pathway leading to liver cell death (apoptosis) and inflammation. Therefore, inhibiting caspase activity is believed to reduce or inhibit apoptosis and inhibition and subsequently reducing disease progression.

**Exhibit 2: Emricasan's Inhibitory Effect of on Members of the Caspase Family**

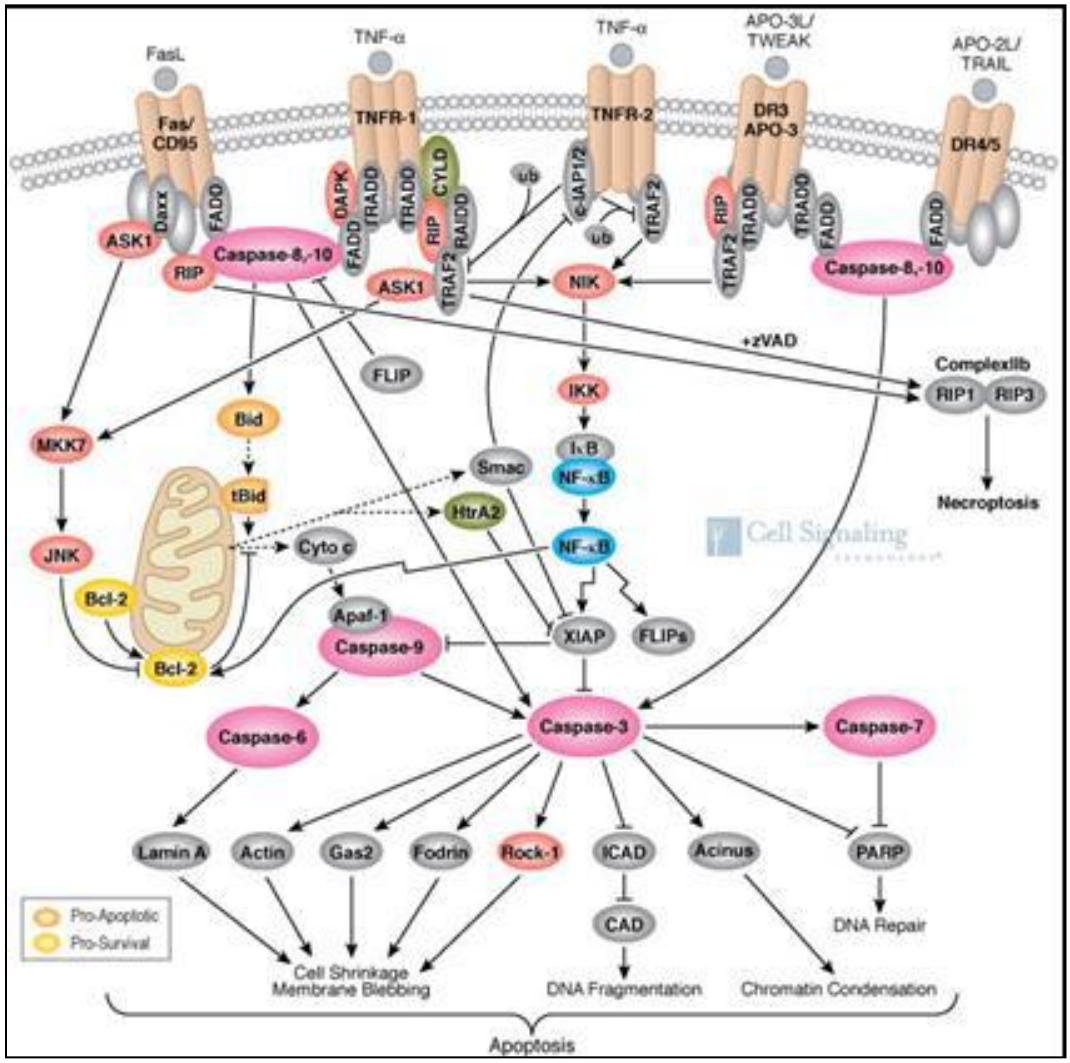



Source: Company reports

Apart from caspase-dependent cell death pathways, there are also caspase-independent pathways. Inhibiting the enzymatic activity of caspases does not prevent cell death that occurs as a result of caspase-independent pathways. In a previous Phase II study, emricasan demonstrated no meaningful increase in HCV or HBV viral load (i.e., virus-producing cells were not kept alive by inhibiting caspase activity).

Members of the caspase family are involved in the initiation and execution of apoptosis (cell death) as well as cytokine processing and inflammation. Caspases, which are intracellular cysteine proteases, cleave substrates at aspartic acid residues. The human genome contains 11 caspases. Emricasan has demonstrated potency across all 11 caspases ($1nM < IC_{50} < 20nM$). Exhibit 3 illustrates the role of members of the caspase family in the extrinsic (or death receptor pathway) and intrinsic (or mitochondrial) pathways leading to apoptosis.

**Exhibit 3: Extrinsic and Intrinsic Pathways Leading to Apoptosis**




Source: Company reports

Of the 11 caspases, the following seven are thought to be involved in apoptosis: 2, 3, 6, 7, 8, 9, and 10. The following three are thought to be involved in inflammation: 1, 4 and 5. Caspases 1, 4 and 5 are cytokine activators which function to mediate the production of pro-inflammatory cytokines such as interleukin-1-beta (IL-1β) and interleukin-18 (IL-18). Inhibition of caspase-1 has been observed to inhibit inflammation but not affect cell death.

Caspases 8 and 10 initiate death receptor (apoptosis) signaling which activates caspases 3 and 7. Post-mitochodrial (intrinsic) stress leads to the activation of caspase 9 which also activates caspases 3 and 7. Caspases 3, 6 and 7 are involved in the execution of apoptosis.

Emricasan is a potent, irreversible, and selective inhibitor of apoptotic and cytokine activating caspases. As a pan-caspase inhibitor, emricasan targets caspases involved in both cell death and inflammation. Reducing the activity of these enzymes is hypothesized to interrupt the progression of liver disease.

**Previously Completed Studies of Emricasan**

In 1998, emricasan was selected as a clinical lead product by Idun Pharmaceuticals and cleared by the FDA to enter early clinical development in 1999. Emricasan has an extensive clinical development history with multiple Phase I/IIa clinical trials completed in 2001/03 along with a Phase IIb dose finding study and chronic toxicology studies were initiated in 2004 prior to the acquisition by Pfizer Inc. (PFE, $28.37, Reduce) in 2005. We summarize the available clinical data as well as safety and biomarker data from its previously completed Phase I and II clinical trials.

**Emricasan Developmental History and Phase I Studies**

To date, over 500 subjects in six Phase I and four Phase II studies have received emricasan. In aggregate, these trials demonstrate that emricasan was generally well-tolerated and decreased levels of the biomarkers [alanine aminotransferase (ALT), cleaved Cytokeratin 18 (cCK18), and aspartate aminotransferase (AST)] correlated with liver disease. Emricasan was observed to have a terminal half-life ranging from 1.7 to 3.1 hours. Exhibit 4 summarizes previously completed Phase I studies of emricasan and their outcomes.

**Exhibit 4: Emricasan Phase I Studies**

| Trial | n (Location) | Dose/Days | Results |
|---|---|---|---|
| Safety and PK study in healthy and liver impaired subjects | 76 (US) | QD/7 days | Well tolerated; improved liver enzymes (ALT) |
| Randomized, open label, PK, dose proportionality study in healthy subjects | 24 (US) | Single dose | Well tolerated; PK profiled |
| Randomized, placebo-controlled, DDI study with ketoconazole in healthy subjects | 24 (EU) | Single dose | Well tolerated; no DDI with ketoconazole |
| Double-blind, randomized, placebo-controlled, PK multiple (escalating) dose study in healthy subjects | 32 (EU) | BID/14 days | Well tolerated; PK profiled |
| Randomized, double-blind, parallel group placebo-controlled, PK multiple (escalating) dose study in healthy Asian subjects | 20 (EU/Asia) | BID/15 days | Well tolerated; no difference in PK in Asian population |
| Randomized, placebo-controlled, DDI study with cyclosporine and measurement of cCK18 levels in healthy subjects | 15 (EU) | QD/BID/10 days | Well tolerated; no effect on cyclosporine; no effect on cCK18 levels |

Source: Company reports

**Emricasan Phase II Studies**

Three of the Phase II trials are noteworthy: 1) a dose escalation study sponsored by Idun, 2) a combined double-blind/open-label dose response study in HCV patients, and 3) a Pfizer-sponsored crossover study in HCV patients.

In the Phase IIa, dose ascending response study sponsored by Idun Pharmaceuticals, BID dosing showed a higher reduction in ALT levels compared to QD dosing over a 14-day study period. Of the 105 patients, 80 had chronic hepatitis C and 25 had other liver diseases (nonalcoholic steatohepatitis, hepatitis B, primary biliary cirrhosis and primary sclerosing cholangitis). Results demonstrated no meaningful increase in HCV or HBV viral load (i.e., virus-producing cells were not kept alive by inhibiting caspase activity) further supporting the observation that caspase inhibition does not block caspase-independent apoptotic pathways. Exhibit 5 summarizes the percent decline in serum ALT levels from baseline to the end of the treatment period for the different doses of emricasan. The 100mg BID group demonstrated the largest decline in serum ALT, while the QD group did not demonstrate a dose response.

**Exhibit 5: Emricasan Once-daily (QD) vs. Twice-Daily (BID) % Decline in ALT**

| Dosage | % Decline in Serum ALT* |
|---|---|
| **QD Group** | |
| 5 mg (n=6) | 15% |
| 25 mg (n=6) | 41% |
| 200 mg (n=6) | 31% |
| **BID Group** | |
| 50 mg (n=6) | 39% |
| 100 mg (n=6) | 56% |
| **Placebo (n=25)** | 0% |

* From baseline to day 14/15

Source: STRH estimates, company reports

The emricasan group also showed a comparable safety profile with approximately half of the patients in both groups experiencing adverse events (AE). The most common AEs reported for patients receiving emricasan largely include the gastrointestinal tract (abdominal pain, dyspepsia, diarrhea and nausea) and central nervous system (headache/dizziness). The most frequent adverse events are summarized in Exhibit 6

**Exhibit 6: Emricasan Adverse Events Reported During Treatment Period**

| | Placebo (n=26) | All Doses of Emricasan (n=79) |
|---|---|---|
| **Patients with AEs** | **14** | **39** |
| AEs occuring in >1 patients | | |
| Abdominal Pain (Upper) | 0 | 6 |
| Dyspepsia | 0 | 6 |
| Fatigue | 0 | 6 |
| Dizziness | 0 | 6 |
| Headache | 1 | 6 |
| Nasopharyngitis | 1 | 5 |
| Diarrhea | 4 | 4 |
| Nausea | 4 | 4 |
| Arthralgia | 0 | 3 |
| Abdominal Pain | 2 | 2 |
| Abdominal distension | 2 | 2 |
| Dry mouth | 1 | 2 |
| Flatulence | 0 | 2 |
| Pain | 1 | 2 |
| Dysgeusia | 0 | 2 |
| Pharyngolaryngeal pain | 2 | 2 |
| Pruritus | 1 | 2 |

Source: STRH estimates, company reports

In the Idun sponsored Phase IIb, double-blind/open-label dose response study in HCV patients, emricasan demonstrated a statistically significant effect in lowering ALT and AST levels versus placebo at 10 weeks (see Exhibit 7). Decreases in ALT and AST levels were observed by 7 days, which was the first measurement period and the effect was maintained throughout the treatment period. Upon discontinuation of emricasan, ALT and AST levels returned to baseline levels within 2 to 4 weeks.

**Exhibit 7: Emricasan Phase IIb % Decline in Serum ALT and AST**

| Dose | AST | ALT | p-value |
|---|---|---|---|
| Placebo | 1% | 6% | -- |
| 5mg BID | 36% | 37% | p<0.0001 |
| 25mg BID | 36% | 42% | p<0.0001 |
| 50mg BID | 39% | 46% | p<0.0001 |

* From baseline to week 10

Source: STRH estimates, company reports

Subjects receiving emricasan were also observed to have a reduction in levels of cCK18. Since cCK18 activity is correlated with caspase activity, this suggests emricasan lowers caspase activity. The observation of a reduction in caspases 3 and 7 enzymatic activity to normal levels (caspases 3 and 7 are involved in the execution of apoptosis) provides additional support to the caspase reduction hypothesis. The study also found that there was no meaningful increase in HCV viral load.

The most frequently reported adverse events in the Phase IIb study were headache and fatigue. Overall, adverse events ranged from mild to moderate in severity. Other common AEs included GI disturbance and headaches. The adverse events seen during the double-blind and open label periods in the Phase IIb study are summarized below in Exhibits 8 and 9.

**Exhibit 8: Emricasan Adverse Events Reported During Double-Blind Treatment Period**

| | Placebo (n=51) | 5mg BID (n=55) | 25mg BID (n=50) | 50mg BID (n=48) |
|---|---|---|---|---|
| Adverse Events (AE) | 97 | 118 | 99 | 129 |
| Patients with AEs | 30 | 42 | 31 | 36 |
| AEs occuring in >6 patients | | | | |
| Headache | 8 | 6 | 5 | 5 |
| Fatigue | 4 | 7 | 4 | 7 |
| Nausea | 2 | 6 | 1 | 6 |
| Diarrhea | 6 | 2 | 2 | 4 |
| Back Pain | 1 | 1 | 4 | 5 |
| Upper Respiratory Tract Infection | 1 | 2 | 2 | 5 |
| Insomnia | 2 | 4 | 2 | 1 |

Source: STRH estimates, company reports

**Exhibit 9: Emricasan Adverse Events Reported During Open-Label Treatment Period**

| | 5 to 100 mg BID (n=39) |
|---|---|
| Adverse Events (AE) | 34 |
| Patients with AEs | 17 |
| AEs occuring in >1 patient | |
| Headache | 2 |
| Fatigue | 2 |
| Arthralgia | 2 |
| Rash | 3 |

Source: STRH estimates, company reports

**The Pfizer Phase II Study, FDA Hold, and Carcinogenicity Analysis**

Pfizer acquired Idun Pharmaceuticals and emricasan in 2005. In a Phase II ascending dose crossover study conducted in 24 patients with chronic HCV and liver fibrosis, the reduction in ALT levels in patients taking emricasan 5mg BID was observed to be similar to that seen in the patients in the aforementioned Phase IIa and IIb studies. However, Pfizer voluntarily discontinued the study prematurely due to the discovery of inflammatory infiltrates in mice in a preclinical study that was conducted in parallel. Subsequently, the FDA placed a clinical hold on emricasan. The FDA clinical hold on emricasan coupled with its decision to shut down its R&D efforts in gastroenterology likely contributed to Pfizer's decision to not move forward with the emricasan program.

Upon re-acquiring the emricasan program in 2010, Conatus reviewed all data from the trials conducted by Pfizer as well as all other available data. An analysis concluded that the inflammatory infiltrates were not pre-cancerous. Conatus's conclusion was further supported by a six-month carcinogenicity study of emricasan in Tg.rasH2 mice (transgenic mice predisposed to develop tumors). The study reproduced the inflammatory infiltrates that Pfizer found but it resulted in no progression to cancer in the mice. This study was sufficient to convince the FDA to lift the clinical hold on emricasan in January 2013.

Pursuant to discussions with the FDA, this study serves as one of two carcinogenicity studies required for registration for HCV-POLT. The second toxicology study, a two year study in rats, will take place concurrently with the upcoming Phase III HCV-POLT trial expected to commence in 2H13.

**Exhibit 10: Emricasan Summary of Phase II Clinical Trials**

| Trial | Design | Entry Criteria | Treatment | Endpoints |
|---|---|---|---|---|
| Emricasan (IDN-6556) Phase IIa ascending dose response study in HCV patients | Four arms: 5mg - 200mg QD, BID, or TID, or placebo. Randomized, placebo controlled, n=105, 2-week study | Patients with HCV, NASH, HBV, and PBC. | 5mg, 25mg, 100mg, or 200mg QD; 5mg, 50mg, 100mg, or 200mg BID; or 5mg TID | Endpoints: safety, changes in ALT |
| Emricasan (PF-03491390) Phase IIb dose response study in HCV | Four arms: 5mg, 25mg, 50mg, and placebo. Randomized, multicenter, placebo-controlled, double-blind, parallel group, n=204, 12 week study | Prior HCV treatment failure with elevatated ALT. Compensated disease with or without fibrosis. | 5mg, 25mg, 50mg or placebo. BID for up to 12 weeks | Endpoints: safety, changes in ALT, AST, cCK18, and caspase 3 and 7 activity |
| Emricasan (PF-03491390) Phase II cross-over dose response study in Chronic HCV | Each patient will receive three of five possible treatments (0.5mg, 1mg, 2.5mg, 5mg or placebo) BID for 13 days and once daily, or QD, on final day of each study period, n=24, three 14-day periods | Patients with chronic HCV infection and liver fibrosis. | 0.5mg, 1mg, 2.5mg, 5mg or placebo. BID for 13 days and QD, on final day of each period | Endpoints: safety, changes in ALT |
| Emricasan Phase II study on liver transplantation storage and flush solutions and administration to liver transplant recipient via IV during 24 hours of transplantation | 4 arms: (1) liver treated with placebo in storage and flush solution with patient given placebo after transplant; (2) liver treated with 15ug/mL emricasan in storage and flush solution with patient given placebo after transplant; (3) liver treated with 5ug/mL emricasan in storage and flush solution with patient given 0.5mg/kg emricasan for 24 hours via IV after transplant; (4) liver treated with 15ug/mL emricasan in storage and flush solution with patient given 0.5mg/kg emricasan for 24 hours via IV after transplant. Randomized, placebo-controlled, double blind study, n=99, 24 hours | Transplant Patients | Livers treated with placebo, 5mg/mL or 15mg/mL in storage and flush solution. Transplant patients treated with placebo, 0.5mg/kg IV for 24 hours after transplant | Endpoints: changes in AST and ALT baseline levels measured up to three days post-transplant |

Source: STRH estimates, company reports

## Clinical Trial Pathway

### Biochemical and Histological Endpoints in Planned Clinical Trials

Conatus is developing emricasan for the treatment of three orphan liver diseases. Since an approval pathway primarily based on clinical outcome would take a significant amount of time and investment, surrogate endpoints appear to be more suitable. Surrogate endpoints are being considered by EU and US regulators for clinical trials in the near term. For the biochemical endpoints in the planned clinical trials, Conatus plans to use the following biomarkers: alanine aminotransferase (ALT), aspartate aminotransferase (AST), and cleaved Cytokeratin 18 (cCK18), which are correlated with inflammation and apoptosis (cell death).

***Alanine aminotransferase (ALT)*** is an enzyme produced in liver cells and naturally found in the blood of healthy people. Unhealthy or damaged liver cells can release ALT into blood and resulting elevated serum levels may indicate liver cell death and inflammation. Emricasan has been shown to reduce levels of serum ALT. Likewise, ***aspartate aminotransferase (AST)*** is another enzyme produced by the liver and found in the blood. As with ALT, emricasan has demonstrated an effect of also reducing levels of serum AST. Elevated levels of AST are indicative of liver inflammation (physicians routinely assess AST and ALT serum levels to diagnose liver inflammation). Consequently, both AST and ALT are considered validated biomarkers of liver disease that are accepted by the medical community.

***Cytokeratin 18*** is a structural protein found in cells, unlike ALT and AST. During apoptosis, it is cleaved by caspases resulting in the release of cleaved Cytokeratin 18 (cCK18) into the blood stream. Healthy individuals have basal levels of serum cCK18. Previously published studies have demonstrated that elevated levels of cCK18 and apoptosis correlate with increased levels of severity of liver disease in patients with a variety of liver diseases (including but not limited to CLF, ACLF and HCV-POLT). In patients with liver disease, the rate of apoptosis exceeds the rate of phagocytosis by macrophages. In a previous phase IIb trial, emricasan demonstrated an effect of reducing levels of serum cCK18.

Although prior animal data strongly suggest that emricasan would lead to a successful clinical trial, no liver disease drugs have been approved based on these endpoints (on inflammation and cell death) in a clinical trial. However, in the context of the high unmet clinical need among liver disease patients, these biomarkers may be the most appropriate endpoints in any future study.

Prior studies have also included biopsies from animal models of liver disease. The histological data demonstrated that animals treated with emricasan had decreased levels of inflammation, apoptosis, and fibrosis. For patients in the upcoming two-year HCV-POLT study expected to start in 2H13, liver biopsies will be performed and scored using the Ishak histology fibrosis scale. It would be ideal to perform biopsies on all patients in clinical trials in addition to assessing the biomarkers; however, it is unrealistic to expect and impractical to have patients undergo multiple liver biopsies within a short timeframe. Besides being invasive and risky due to potential complications given that patients will likely have various co-morbidities, liver biopsies are also costly procedures.

The biochemical and histological endpoints that Conatus plans to use in its upcoming clinical trials are summarized below:

**Exhibit 11: Summary of Biochemical (Biomarker) and Histological Endpoints**

| Trial | Biochemical | Histological |
|---|---|---|
| Phase IIb: Acute-on-Chronic Liver Failure (ACLF) | ALT, AST, and cCK18 | N/A |
| Phase IIb: Chronic Liver Failure (CLF) | ALT, AST, and cCK18 | N/A |
| Phase IIb/III: HCV Recurrence Post Transplant (HCV-POLT) | ALT, AST, and cCK18 | Liver biopsies evaluated using Ishak Fibrosis Scores |
| Phase III: Acute-on-Chronic Liver Failure (ACLF) | ALT, AST, and cCK18 | N/A |

Source: STRH estimates, company reports

**Overview of Potential Orphan Therapeutic Indications**

Liver disease may be caused by a variety of insults including but not limited to the hepatitis C virus, the hepatitis B virus, excessive alcohol consumption, and autoimmune diseases. These insults are thought to increase inflammation and apoptosis via caspase activation which may result in fibrosis. Ultimately, fibrosis may lead to cirrhosis resulting in a reduction of liver function. Patients with reduced liver function may decompensate and eventually require a liver transplant.

Conatus is currently in discussions with regulators in the US and EU for three potential orphan indications in liver disease for emricasan: chronic liver failure (CLF), acute-on-chronic liver failure (ACLF), and Hepatitis C virus-related post-orthotopic liver transplant (HCV-POLT). The total US and EU populations for each of these indications is estimated to be approximately 10,000 CLF patients, 150,000 ACLF patients, and 50,000 HCV-POLT patients.

**FDA/AASLD Workshop on Liver Disease Trial Design**

On September 5th - 6th, 2013, the FDA and the American Association for Study of Liver Disease (AASLD) are scheduled to conduct a jointly sponsored workshop on clinical trial design for nonalcoholic fatty liver disease (NAFLD) and its related complications of nonalcoholic steatohepatitis (NASH) and fibrosis/cirrhosis.

We view this as a key event as it could provide insight on the agency's perspective on using surrogate (i.e., biomarker and histological) as well as clinical endpoints in a subset of liver disease trials, which could potentially have implications for a certain portion (and possibly larger fraction) of the patient population that Conatus is targeting. Based on the published agenda, we think the panel titled "FDA Perspectives on Key Needs in the Field to Guide Development in NASH and Fibrosis" (L. Dimick, MD) is of particular note as it should reveal the agency's viewpoint. Additional panels that could prove to be revealing are "Defining Drug Efficacy for NASH: What are the Best Endpoints for Early Phase and Late Phase Studies in Adults - A Clinician's Perspective" (A. Sanyal, MD) and "What is the Best Intermediate-Term Surrogate: (1-2 years) Endpoint for Treatment Trials with Fibrosis as a Therapeutic Target?" (A. Sanyal, MD).

While not the specific focus of the meeting, the workshop could also provide some limited insight into the agency's thinking on CLF, ACLF, and HCV-POLT as orphan disease indications. While it appears that there is a fair amount of agreement in the hepatology community on which patients are experiencing CLF, there is no clear consensus on what precisely constitutes ACLF. Additionally, there is some divergence between European and US regulators on the acceptability of surrogate endpoints, and the workshop could help to gauge in which direction the FDA is leaning.

**Exhibit 12: FDA/AASLD Workshop Agenda on Liver Disease Clinical Trial Design**

| Thursday, September 5 | Talk Title | Presenter(s) |
|---|---|---|
| | **Session 1: FDA Perspectives on Clinical Trial Designs and Natural History in NAFLD** | Moderators: Arun J. Sanyal, MD and Scott L. Friedman, MD |
| 8:00 am - 8:05 am | Introduction and Overview of Meeting | |
| 8:05 am - 8:25 am | FDA Perspectives on Key Needs in the Field to Guide Development in NASH and Fibrosis | Lara L. Dimick, MD |
| 8:25 am - 8:50 am | Defining Clinical Outcomes in NAFLD for Adults and Children | Arthur J. McCullough, MD |
| 8:50 am - 9:20 am | Rates of Fibrosis Progression/Regression in Varying Phenotypes of NAFLD and Confounding Variables that Affect It | David Kleiner, MD, PhD |
| 9:20 am - 9:45 am | Open Forum and Panel Discussion | |
| 9:45 am - 10:00 am | Break | |
| | **Session 2: Treatment Trials in NASH (What Are the Options for Surrogate and Clinical Benefit Endpoints for NAFLD/NASH Trials?)** | Moderators: Brent A. Tetri, MD and Lara L. Dimick, MD |
| 10:00 am - 10:25 am | Defining Drug Efficacy for NASH: What are the Best Endpoints for Early Phase and Late Phase Studies in Adults - A Clinician's Perspective | Arun J. Sanyal, MD |
| 10:25 am - 10:45 am | Safety Related Outcomes in Treatment Trials for NAFLD | Naga P. Chalasani, MD |
| 10:45 am - 11:10 am | Trial Design Considerations and Endpoints for Development of Diagnostics for Pediatric Subjects with NAFLD | Joel E. Lavine, MD, PhD |
| 11:10 am - 12:00 pm | Panel and Open Forum Discussion | |
| 12:00 pm - 1:00 pm | Lunch | |
| | **Session 3: Diagnostics in NASH (How Are Surrogate and Clinical Benefits Endpoints Measured?)** | Moderators: Joel E. Lavine, MD, PhD, and Arthur J. McCullough, MD |
| 1:00 pm - 1:25 pm | What are the Key Clinical Questions that Require Development of Diagnostic Tools? | Rohit Loomba, MD |
| 1:25 pm - 1:40 pm | Key Issues in Trial Design for Diagnostics for NASH | Brent A. Tetri, MD |
| 1:40 pm - 2:00 pm | Evaluation of the State of Imaging Tests for Liver Fibrosis and Fat | Claude B. Sirlin, MD |
| 2:00 pm - 2:20 pm | Safety Related Outcomes and Diagnostics in Treatment Trials for Pediatric NAFLD | Miriam Vos, MD, MSPH |
| 2:20 pm - 3:00 pm | Open Forum and Panel Discussion | |
| 3:00 pm - 3:15 pm | Break | |
| | **Session 4: Clinical Trials for Advanced Fibrosis** | Moderators: Arun J. Sanyal, MD and Don C. Rockey, MD |
| 3:15 pm - 3:40 pm | Relating Changes in HPVG to Clinical Outcomes in Cirrhosis - Quality Metrics for Liver Histology and HVPG Measurement in Studies of Fibrosis | Guadalupe Garcia-Tsao, MD |
| 3:40 pm - 4:00 pm | Stratification of Subjects for Anti-fibrotic Trials: Use of Genetic Markers, HVPG, Quantitative Liver Function Tests etc. | Scott L. Friedman, MD |
| 4:00 pm - 4:20 pm | What is the Best Intermediate-Term Surrogate: (1-2 years) Endpoint for Treatment Trials with Fibrosis as a Therapeutic Target? | Arun J. Sanyal, MD |
| 4:20 pm - 5:00 pm | Open Forum for Discussion | |
| | Adjourn Day One | |

| Friday, September 6 | Talk Title | Presenter(s) |
|---|---|---|
| | **Session 1: Diagnostics in Fibrosis** | Naga P. Chalasani, MD and Don C. Rockey, MD |
| 8:00 am - 8:20 am | Elastography as a Way to Assess Changes in Fibrosis | Marc G. Ghany, MD |
| 8:20 am - 8:40 am | Quantitative Liver Function Tests and Their Utility to Assess Liver Related Outcomes | Gregory T. Everson, MD |
| 8:40 am - 9:00 am | Strengths and Weaknesses of Measures of Fibrosis: Defining A Gold Standard For Diagnostics Development | Scott L. Friedman, MD |
| 9:00 am - 9:30 am | Open Forum and Panel Discussion | |
| 9:30 am - 10:00 am | Break | |
| | **Session 2: Wrap - Up Discussions** | |
| 10:00 am - 11:30 am | Trial Design, Population Prioritization and Endpoints for Diagnostics in NASH | Arthur J. McCullough, MD |
| 11:30 am - 12:30 pm | Lunch | |
| 12:30 pm - 1:00 pm | Trial Design, Population Prioritization and Endpoints for Diagnostics and Therapeutics for Advanced Fibrosis and Cirrhosis | Don C. Rockey, MD |
| 1:00 pm - 2:30 pm | Safety Related Endpoints in NASH and Fibrosis/Cirrhosis Trials | Naga P. Chalasani, MD |
| 2:30 pm - 3:00 pm | Wrap Up | |

Source: www.FDA.gov and AASLD

**Regulatory Interactions with the EU and the FDA**

In ACLF and CLF, Conatus plans to use biomarkers (ALT, AST, and cCK18) as surrogate endpoints to predict efficacy. In HCV-POLT, the company plans to assess both biomarkers and liver histology as endpoints. Throughout the process of designing the clinical trials for these indications, Conatus has held multiple meetings with the US, UK and German regulatory authorities regarding these indications and the use of surrogate endpoints. Also, during the company's meetings with UK MHRA (in May 2012) and German BfArM (in June 2012) regulatory authorities they discussed whether the ACLF and HCV-POLT trials could qualify as single registration studies pending the outcome of the Phase II results. The UK MHRA required a cyclosporine DDI study and the German BfArM required fertility studies prior to the start of Phase III along with cCk18 data in healthy volunteers. Conatus plans to file for orphan drug designation status for ACLF in the US and EU in 2H13. In December 2012, it submitted its eIND to the FDA. It was agreed that its carcinogenicity study was clean and served as one of two required carcinogenicity studies.

With the EU review of the company's data completed, it was agreed that there is a basis to move forward with a study in HCV-POLT with these endpoints. However, the HCV-POLT trial will be considered a Phase IIb trial in the US and a Phase III trial in the EU. The Phase IIb/III trial in HCV-POLT is on track to initiate in 2H13. Conatus is seeking orphan drug designation for HCV-POLT in the US and EU. We anticipate that Conatus will resume its communication with the FDA regarding the endpoints in the HCV-POLT indication after the September joint FDA/AASLD meeting on liver disease clinical trial design.

**Emricasan in Chronic Liver Failure (CLF): Current Status**

The CLF population in the US and EU is estimated at about 10,000 patients. Its causes include viral infections, alcohol, nonalcoholic steatohepatitis (NASH), and autoimmune diseases.

CLF patients frequently deteriorate to the point where they require a liver transplant. However, due to the shortage of livers available for transplant, patients are assigned a Model for End-Stage Liver Disease (MELD) score to assess the severity of their disease and to determine whether the patient will be placed on a waiting list to receive a transplant. MELD scores are generally considered to be good predictors of three-month survival following assessment. Scores range from 6 to40 and are calculated by assessing bilirubin, creatinine, and blood clotting times. The average MELD score is 20 for patients undergoing liver transplants.

Conatus is expected to initiate a Phase IIb trial of emricasan in 90 patients with CLF in 2H14. The goal of the treatment in CLF is to slow or stop the progression of liver disease so that patients may become eligible for a liver transplant or survive to be able to receive a liver transplant. The study will also assess changes in serum biomarker levels and time to clinical worsening following 28 days of treatment as secondary endpoints. Clinical worsening is defined as the occurrence of a liver transplant, next-organ failure, or death. After the 28-day treatment, a follow-up with patients will occur at one month and three months. The study will include patients with MELD scores ranging from 20 to 30. Within the three month study period of the trial, approximately 25% of the target population is expected to receive a liver transplant, be denied a liver transplant, or die.

**Exhibit 13: Emricasan Proposed CLF Phase IIb Study Design**

| Indication | Design | Entry Criteria | Treatment | Endpoints | Comments |
|---|---|---|---|---|---|
| Chronic Liver Failure | Phase IIb; n=90; for 28-days; 1M and 3M followup | 20 < MELD Score < 30 | 25 mg BID | 1° endpoint: TTCW. 2° endpoints: changes in ALT, AST, and cCK18 | Starts 2H14E |

Source: STRH estimates, company reports

With regard to the development path for emricasan in CLF, we expect that data from the Phase IIb trial could be presented in 2H15. Assuming the data warrants a continuation, we anticipate that Conatus will commence a Phase III study in early 2016 with results potentially being release later that year. This could position Conatus to submit its EU approval filing by YE2016 and launch emricasan for CLF in 2017. Given the evolving nature of its discussions with the FDA, the exact design of a Phase III US trial is not yet known but we assume Conatus will be able to launch

emricasan for CLF in the US in 2018. Our anticipated timeline for emricasan in CLF is summarized below in Exhibit 14.

**Exhibit 14: Emricasan CLF Clinical Development Timeline**

| Event | Expected |
|---|---|
| Initiate Phase IIb, 28-day, 90-pt study, emricasan in CLF | 2H14E |
| Top-line data, phase IIb trial, emricasan in CLF | 2H15E |
| Initiate Phase III | 2016E |
| Top-line data, phase III trial, emricasan in CLF | 2016E |
| File MAA | 2016E |
| File NDA | 2016E |
| EU Pricing | 2017E |
| ***EU Launch*** | **2017E** |
| ***US Launch*** | **2018E** |

Source: STRH estimates, company reports

**Emricasan in Acute-on-Chronic Liver Failure (ACLF): Current Status**

Although there is no uniform definition of acute-on-chronic liver failure (ACLF) within the clinical and regulatory communities, the term continues to become better defined and accepted amongst hepatologists. It is estimated that there are approximately 150,000 ACLF patients in the US and EU.

Conatus is expected to initiate a Phase IIb trial in emricasan for ACLF in 2H13. The study will include patients with MELD scores ranging from 20 to 30 and histories normally associated with acute decompensation. Within the 28-day study period of the trial, approximately 45% of the target population is expected to require a liver transplant, experience next-organ failure, or die. The goal of the treatment in ACLF is to reverse the factors leading to the progression of liver disease in order to allow the liver to have time to repair.

We anticipate that the Phase IIb study will be conducted to determine the dosing for a future Phase III ACLF study. The Phase IIb study is expected to be a 60 patient, 28-day randomized study with 4 arms: placebo, 5 mg, 25 mg and 50 mg. After the 28-day treatment, follow-up with patients is expected to occur at two, three, and six months. Secondary endpoints are expected to include time to clinical worsening (TTCW) and biomarkers. If the study commences in 2H13 as expected, top-line data could be available in 1H14. Our trial assumptions are detailed below in Exhibit 15

**Exhibit 15: Emricasan ACLF Phase IIb Study Design**

| Indication | Design | Entry Criteria | Treatment | Endpoints | Comments |
|---|---|---|---|---|---|
| Acute-on-Chronic Liver Failure | Phase IIb dosing; n=60; for 28 days; 2M, 3M, 6M followup | 20 < MELD Score < 30, history of cirrhosis, acute deterioriation of liver function for >24 hours. | 5 mg, 25 mg, and 50 mg BID | 1° Dosing PK and safety. 2° endpoints: TTCW, changes in ALT, AST, cCK18, MELD score | Start 2H13E in the UK; possible data in 1H14E |

Source: STRH estimates, company reports

A positive Phase IIb result could potentially lead regulators to permit a single registration Phase III trial. Under such a scenario, we anticipate that Conatus would shift to a clinical endpoint such as TTCW as a primary endpoint with the biomarkers (including but not limited to AST, ALT, and cCK18) as secondary endpoints.

If EU regulators permit this, we envision that the Phase III ACLF trial would be a 400 patient trial with assessments at 28 days and 6 months. We assume that a Phase III trial would utilize the same inclusion criteria detailed below in Exhibit 16. However, in order to assess emricasan more accurately, patients initially assigned to the treatment group could be re-randomized after 28 days to either continue treatment or receive placebo. Below is a summary of a proposed design for a Phase III trial in ACLF.

**Exhibit 16: Emricasan ACLF Phase III Study Design**

| Indication | Design | Entry Criteria | Treatment | Endpoints | Comments |
|---|---|---|---|---|---|
| Acute-on-Chronic Liver Failure | Phase III; n=400; for 28 days extended to 6M, emricasan patients re-randomized at 28-days to emiracasan or placebo; follow up at 7M, 9M, 12M | 20 < MELD Score < 30, history of cirrhosis, acute liver deterioration for >24 hours. | 25 mg BID | 1° endpoint: TTCW at 28 days. 2° endpoints: changes in ALT, cCK18 | Possible single registration in EU. Discussions w/ FDA on a single US registration following Phase IIb |

Source: STRH estimates, company reports

If successful, a single registration study for ACLF could prove to be sufficient to file for approval in the EU. Our model currently assumes top-line data in 2016 with a filing and launch to follow in 2017.

In the US, Conatus plans to discuss its registration strategy with the FDA after reviewing data from the Phase IIb study in ACLF. Conatus also believes that the Phase IIb CLF trial may serve as a second registration trial for ACLF in the event a second trial is required. Given the relative lack of visibility on an approval pathway, we assume that a supplemental NDA filing would come no earlier than 2018 with a US launch to follow in 2019. Our estimated timeline for emricasan in ACLF is summarized below in Exhibit 17:

**Exhibit 17: Emricasan ACLF Development Timeline**

| Event | Expected |
|---|---|
| Initiate Phase IIb, 28-day, 60-pt dose ranging study | 2H13E |
| Top-line data, phase IIb trial, emricasan in ACLF | 1H14E |
| End of phase IIb meetings with both US and EU | 2H14E |
| Initiate Phase III, 390-pt, 6 mo. Study | 1H15E |
| Top-line data, phase III trial, emricasan in ACLF | 1H16E |
| File MAA | 2017E |
| EU Pricing | 2017E |
| ***EU Launch*** | **2017E** |
| File sNDA | 2018E |
| ***US Launch*** | **2019E** |

Source: STRH estimates, company reports

**Emricasan in HCV-related Post-Orthotopic Liver Transplant (HCV-POLT): Current Status**

Hepatitis C virus (HCV) patients who have received liver transplants have a high risk of HCV recurrence and also often experience faster than average rate of fibrosis development and subsequently cirrhosis. Current interferon based anti-viral therapy treatment options are often ineffective and not well tolerated in patients.

Conatus is expected to initiate a US Phase IIb/EU Phase III two year dosing study of emricasan for HCV-POLT in 2H13. The study will be limited to patients receiving liver transplants.

Based on a compilation of the effect of emricasan on apoptotic and inflammatory biomarkers in all of the previous trials involving HCV patients, 25mg twice-daily (BID) dose was selected. The 25 mg BID dose demonstrated the highest percent of maximum response versus the other dosages.

**Exhibit 18: Emricasan Dosing Impact on Biomarkers**

| Dose | CK-18 | ALT | AST | Caspase 3/7 |
|---|---|---|---|---|
| 5 mg BID | 83.6 | 71.2 | 46.3 | 36.7 |
| 15 mg BID | 93.9 | 88.1 | 72.1 | 63.5 |
| 25 mg BID | 96.2 | 92.5 | 81.2 | 74.4 |

Source: STRH estimates, company reports

The study will also likely utilize both histological in addition to the previously discussed biochemical endpoints. The histological endpoints will be assessed under the Ishak fibrosis scoring system. The Ishak scale ranges from 0 (no fibrosis) to 6 (cirrhosis). An Ishak score ≥3 indicates significant fibrosis. An Ishak score of 5-6 indicates cirrhosis.

After the start of the study, enrolled patients will undergo liver biopsies after 4-6 weeks, one year, and 2 years. A three year follow-up of the patients is also expected to occur.

**Exhibit 19: Emricasan Planned Phase IIb/III Study in HCV-POLT**

| Indication | Design | Entry Criteria | Treatment | Endpoints | Comments |
|---|---|---|---|---|---|
| HCV-POLT | EU: Phase III / US: Phase IIb Randomized, double-blind; n=260; biopsy at 28 days, 1Y, 2Y | Antiviral failure/ intolerability post liver transplant | 25 mg BID | 1° endpoint: Change from baseline Ishak Fibrosis score. 2° endpoints: changes in ALT, AST, & cCK18 | Starts 2H13E; data possibly in 2015E |

Source: STRH estimates, company reports

Conatus is also waiting on feedback from European authorities regarding a single registration study. In the US, pending ongoing discussions with the FDA, additional registrations may be required. Conatus has filed for orphan drug designation in the US and is currently waiting to hear back from the FDA. However, Conatus withdrew its orphan designation application in the EU following feedback that emricasan may be applicable to a broader population.

If Conatus initiates its HCV-POLT Phase IIb/III trial in 2H13 as anticipated, this could permit 1-year data to potentially be presented at AASLD '14. This data point could give insight into whether the delay in the rate of disease progression is meaningful given that roughly 55% of the target population is expected to progress at least one stage on the Ishak fibrosis score during the study. We detail our estimated clinical and approval timelines for emricasan in HCV-POLT in Exhibit 20 below:

**Exhibit 20: Emricasan HCV-POLT Development Timeline**

| Event | Expected |
|---|---|
| Initiate Phase III, 2-yr, 260-pt single registration study in UK | 2H13E |
| Initiate Phase IIb, 2-yr, 260-pt single registration study in US | 2H13E |
| Top-line data, phase IIb trial | 2014E |
| Initiate Phase III, US | 1H15E |
| Top-line data, phase III trial, emricasan in HCV-POLT | 2017E |
| File NDA | 2017E |
| EU Pricing | 2018E |
| ***EU Launch*** | **2H18E** |
| File sNDA | 2019E |
| ***US Launch*** | **2020E** |

Source: STRH estimates, company reports

## Emricasan Market Opportunity

In this section we describe the various market opportunities that Conatus is pursuing in chronic liver failure (CLF), acute-on-chronic liver failure (ACLF), and Hepatitis C virus-related post-orthotopic liver transplant (HCV-POLT). Acute-on-chronic liver failure, chronic liver failure, and HCV-related post-orthotopic liver transplant are novel indications and there are no drugs approved in the diseases being targeted. In particular, we detail our estimated patient populations, eligibility, pricing, and peak penetration assumptions in the US and Europe that underlie our market size and sales estimates.

### Chronic Liver Failure (CLF)

The addressable CLF populations in the US and the EU are estimated at 4,000 and 6,000 patients, respectively. Our model assumes that Conatus pursues CLF as a lead indication in Europe before the US given 1) it is a better defined and accepted clinical diagnosis amongst hepatologists and payors than ACLF, and 2) European regulators have thus far expressed greater willingness than the FDA to accept surrogate endpoints for liver disease trials.

Assuming Conatus garners approval in Europe in 2017, we estimate that 100% of patients are potentially eligible for treatment with emricasan with the treatment duration lasting just 1.0 month given the high mortality, organ failure, and transplant rates (duration is assumed to grow modestly as hepatologists begin to administer emricasan earlier in the treatment plan). Using approved orphan disease drugs and population sizes as reference points, we estimate that monthly treatment costs will average $7,000 in the major Western European markets with limited annual price degradation given the low number of patients treated. If Conatus successfully launches and markets emricasan for CLF, we estimate peak market penetration at 51% in 2025. This could result in approximately 3,000 patients being treated annually, which we estimate equates to a roughly $30 million market in Europe.

We anticipate US approval for emricasan in CLF in 2018. While we similarly assume that treatment duration in the US will initially be 1.0 month, we assume that monthly treatment cost will be higher at $10,000 with both modestly rising over time. If Conatus replicates its European launch in the US, at a peak penetration of 57% in 2025 we estimate nearly 2,200 patients will be treated annually resulting in a US market size of over $44 million. We detail our CLF assumptions and market size estimates below in Exhibit 21.

We currently risk adjust our market estimates at 15%, which yields a 2025 year revenue of $11 million for the CLF indication.

**Exhibit 21: Emricasan Estimated Conatus Chronic Liver Failure (CLF) Market Model = 2013E to 2025E**

| CLF (U.S.) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLF population | 4,000 | 4,004 | 4,008 | 4,012 | 4,016 | 4,020 | 4,024 | 4,028 | 4,032 | 4,036 | 4,040 | 4,044 | 4,048 |
| YoY% Change in Population | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 4,000 | 4,004 | 4,008 | 4,012 | 4,016 | 4,020 | 4,024 | 4,028 | 4,032 | 4,036 | 4,040 | 4,044 | 4,048 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.0% | 21.0% | 27.0% | 33.0% | 39.0% | 45.0% | 51.0% | 57.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 603 | 845 | 1,088 | 1,331 | 1,574 | 1,818 | 2,063 | 2,308 |
| Monthly cost (Dollars '000) | $10 | $10 | $10 | $10 | $10 | $11 | $11 | $12 | $12 | $13 | $13 | $14 | $15 |
| Duration (1-3 months) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 | 1.3 | 1.3 | 1.4 |
| **Total U.S. sales - CLF ('000)** | **$0** | **$0** | **$0** | **$0** | **$0** | **$6,332** | **$9,810** | **$13,925** | **$18,745** | **$24,349** | **$30,820** | **$38,251** | **$46,741** |
| YoY % change | | NM | NM | NM | NM | NM | 55% | 42% | 35% | 30% | 27% | 24% | 22% |

**CLF**

| CLF (EU) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLF population | 6,000 | 6,006 | 6,012 | 6,018 | 6,024 | 6,030 | 6,036 | 6,042 | 6,048 | 6,054 | 6,060 | 6,066 | 6,072 |
| YoY% Change in Population | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 6,000 | 6,006 | 6,012 | 6,018 | 6,024 | 6,030 | 6,036 | 6,042 | 6,048 | 6,054 | 6,060 | 6,066 | 6,072 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 7.0% | 12.5% | 18.0% | 23.5% | 29.0% | 34.5% | 40.0% | 45.5% | 51.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 422 | 754 | 1,086 | 1,420 | 1,754 | 2,089 | 2,424 | 2,760 | 3,097 |
| Monthly cost (Dollars '000) | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 |
| Duration (1-3 months) | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.1 | 1.1 | 1.2 | 1.2 | 1.3 | 1.3 | 1.4 | 1.4 |
| **Total EU sales - CLF ('000)** | **$0** | **$0** | **$0** | **$0** | **$2,952** | **$5,556** | **$8,412** | **$11,520** | **$14,881** | **$18,495** | **$22,365** | **$26,489** | **$30,870** |
| YoY % change | | NM | NM | NM | NM | 88% | 51% | 37% | 29% | 24% | 21% | 18% | 17% |

| CLF | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Sales - CLF** | **$0** | **$0** | **$0** | **$0** | **$443** | **$1,783** | **$2,733** | **$3,817** | **$5,044** | **$6,427** | **$7,978** | **$9,711** | **$11,642** |
| YoY % change | | NM | NM | NM | NM | 303% | 53% | 40% | 32% | 27% | 24% | 22% | 20% |

Source: STRH estimates, company reports, CDC, EASL

**Acute-on-Chronic Liver Failure (ACLF)**

The ACLF population is estimated to be substantially larger than the CLF population with nearly 64,000 patients in the US and over 86,000 patients in Europe. Based on anticipated clinical trial and regulatory timeframes, we assumed that Conatus will adopt a similar strategy for ACLF as it will for CLF. Conatus is expected release topline ACLF data in 2016 and file in Europe in 2017 and launch later that year with a US filing to follow in 2018.

Our ACLF model assumes identical pricing as with CLF and 100% patient eligibility. Additionally, we assume a slightly lower initial treatment duration of 0.9 month but a sharper rise to 1.5 months following the launch as hepatologists are likely to prescribe emricasan earlier as their comfort with it rises in this indication. We also assume a higher percentage of EU patients receiving emricasan for ACLF than for CLF.

Consequently, we estimate the peak year market size in Europe at $754 million and $830 million in the US. As with CLF, we risk adjust our sales estimates by 15% which drives our 2025 forecast of $238 million.

**Exhibit 22: Emricasan Estimated Conatus Acute-on-Chronic Liver Failure (ACLF) Market Model – 2013E to 2025E**

| ACLF (U.S.) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACLF population[1] | 63,739 | 63,803 | 63,867 | 63,930 | 63,994 | 64,058 | 64,122 | 64,187 | 64,251 | 64,315 | 64,379 | 64,444 | 64,508 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 63,739 | 63,803 | 63,867 | 63,930 | 63,994 | 64,058 | 64,122 | 64,187 | 64,251 | 64,315 | 64,379 | 64,444 | 64,508 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.0% | 21.0% | 27.0% | 33.0% | 39.0% | 45.0% | 51.0% | 57.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 9,609 | 13,466 | 17,330 | 21,203 | 25,083 | 28,971 | 32,866 | 36,770 |
| Monthly cost (Dollars '000) | $10 | $10 | $10 | $10 | $10 | $11 | $11 | $12 | $12 | $13 | $14 | $14 | $15 |
| Duration (1-6 months) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Total U.S. sales - ACLF** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$136,158** | **$306,663** | **$393,944** | **$489,338** | **$593,444** | **$706,905** | **$830,403** |
| YoY % change | | NM | NM | NM | NM | NM | NM | 125% | 28% | 24% | 21% | 19% | 17% |

**ACLF**

| ACLF (EU) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACLF population* | 86,261 | 88,771 | 91,354 | 94,013 | 96,749 | 99,564 | 102,461 | 105,443 | 108,511 | 111,669 | 114,919 | 118,263 | 121,704 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 86,261 | 88,771 | 91,354 | 94,013 | 96,749 | 99,564 | 102,461 | 105,443 | 108,511 | 111,669 | 114,919 | 118,263 | 121,704 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 7.0% | 13.5% | 20.0% | 26.5% | 33.0% | 39.5% | 46.0% | 52.5% | 59.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 6,772 | 13,441 | 20,492 | 27,942 | 35,809 | 44,109 | 52,863 | 62,088 | 71,805 |
| Monthly cost (Dollars '000) | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 |
| Duration (1-6 months) | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| **Total EU sales - ACLF** | **$0** | **$0** | **$0** | **$0** | **$42,666** | **$141,132** | **$215,169** | **$293,395** | **$375,992** | **$463,147** | **$555,057** | **$651,923** | **$753,957** |
| YoY % change | | NM | NM | NM | NM | 231% | 52% | 36% | 28% | 23% | 20% | 17% | 16% |

| ACLF | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Sales - ACLF** | **$0** | **$0** | **$0** | **$0** | **$6,400** | **$21,170** | **$52,699** | **$90,009** | **$115,490** | **$142,873** | **$172,275** | **$203,824** | **$237,654** |
| YoY % change | | NM | NM | NM | NM | 231% | 149% | 71% | 28% | 24% | 21% | 18% | 17% |

Source: STRH estimates, company reports, CDC, EASL

**Hepatitis C Virus-Related Post-Orthotopic Liver Transplant (HCV-POLT)**

Unlike the CLF and ACLF populations which are expected to remain fairly constant, the HCV-POLT patient pool is forecasted to shrink significantly over time. This is primarily due to the expected emergence of interferon-free (IFN) direct-acting anti-virals (DAA) currently being developed and whose launches are anticipated to coincide with emricasan. Gilead's (GILD,NR) sofosbuvir (nucleotide analogue inhibitor) is expected to be the first followed possibly by AbbVie's (ABBV,NR) tripled-drug combination ABT-450/ABT-267/ABT-333 and Bristol Myers Squibb's (BMY, $41.68, Buy) aclatasvir. The impact from these next generation products is expected to begin to be felt starting in 2017 and should reduce the HCV prevalence pools in the US and EU to roughly a third of their current size (approximately 7,000 patients each by 2025).

We do not view the rise of DAAs as negatively affecting Conatus's market opportunity as we already assume the current transplant patient pool (about 15,000 total patients) who will not respond to therapy as creating a floor of potential emricasan patients. We detail our HCV-POLT patient pool estimates below in Exhibit 23:

**Exhibit 23: Emricasan Estimated Conatus HCV-POLT Market Model – 2013E to 2025E**

| HCV-POLT (U.S.) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCV-POLT population | 21,500 | 21,550 | 21,575 | 21,575 | 19,000 | 16,500 | 13,500 | 11,500 | 10,515 | 9,500 | 8,500 | 7,500 | 7,200 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 21,500 | 21,550 | 21,575 | 21,575 | 19,000 | 16,500 | 13,500 | 11,500 | 10,515 | 9,500 | 8,500 | 7,500 | 7,200 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.0% | 20.5% | 26.0% | 31.5% | 37.0% | 42.5% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,725 | 2,156 | 2,470 | 2,678 | 2,775 | 3,060 |
| Monthly cost (Dollars '000) | $10 | $10 | $10 | $10 | $10 | $11 | $11 | $12 | $12 | $13 | $13 | $14 | $15 |
| Duration (2 yrs - life) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| **Total U.S. Sales - HCV-POLT** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$239,628** | **$314,414** | **$378,290** | **$430,573** | **$468,564** | **$542,522** |
| YoY % change | | NM | NM | NM | NM | NM | NM | NM | 31% | 20% | 14% | 9% | 16% |

**HCV-POLT**

| HCV-POLT (EU) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HCV-POLT population | 24,500 | 25,000 | 25,000 | 25,550 | 21,050 | 19,500 | 17,000 | 14,000 | 12,085 | 10,000 | 9,500 | 9,000 | 7,500 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 24,500 | 25,000 | 25,000 | 25,550 | 21,050 | 19,500 | 17,000 | 14,000 | 12,085 | 10,000 | 9,500 | 9,000 | 7,500 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 7.0% | 12.0% | 17.0% | 22.0% | 27.0% | 32.0% | 37.0% | 42.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 1,365 | 2,040 | 2,380 | 2,659 | 2,700 | 3,040 | 3,330 | 3,150 |
| Monthly cost (Dollars '000) | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 |
| Duration (2 yrs - life) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| **Total EU Sales - HCV-POLT** | **$0** | **$0** | **$0** | **$0** | **$0** | **$114,660** | **$171,360** | **$199,920** | **$223,331** | **$226,800** | **$255,360** | **$279,720** | **$264,600** |
| YoY % change | | NM | NM | NM | NM | NM | 49% | 17% | 12% | 2% | 13% | 10% | -5% |

| HCV-POLT | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Sales - HCV-POLT** | **$0** | **$0** | **$0** | **$0** | **$0** | **$17,199** | **$25,704** | **$65,932** | **$80,662** | **$90,763** | **$102,890** | **$112,243** | **$121,068** |
| YoY % change | | NM | NM | NM | NM | NM | 49% | 157% | 22% | 13% | 13% | 9% | 8% |

Source: STRH estimates, company reports, CDC, EASL

Our model assumes topline EU data in 2017 with a filing later that year and a launch in 2018. While we expect the same pricing as for CLF/ACLF, we view emricasan as a maintenance therapy for HCV-POLT requiring ongoing treatment (12.0 months duration). Additionally, with likely higher cure rates, we assume that the portion of patients receiving emricasan will ramp slowly rather than be a bolus following launch. Consequently, we forecast the EU market size at $265 million and the US market at $542 million giver higher pricing in the later.

We risk adjust our market size estimate by 15% and expect $121 million in 2025E HCV-POLT sales.

In aggregate, we estimate the cumulative market size for emricasan at $1.0 billion in 2020 and expanding to $2.4 billion by 2025 and approaching $3 billion by 2028. On a risk adjusted basis, we forecast revenue of $370 million in 2025. Our risk adjusted emricasan aggregate revenue forecast for the three orphan drug indications is below in Exhibit 24.

**Exhibit 24: Conatus 2013E-2025E Risk Adjusted Revenue Forecast for CLF + ACLF + HCV-POLT**

| CLF + ACLF + HCV-POLT Sales | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Unadjusted Total Sales - Emricasan** | **$0** | **$0** | **$0** | **$0** | **$45,618** | **$267,679** | **$540,909** | **$1,065,051** | **$1,341,306** | **$1,600,419** | **$1,887,619** | **$2,171,853** | **$2,469,093** |
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Risk Adjusted Emricasan Sales ('000)** | **$0** | **$0** | **$0** | **$0** | **$6,843** | **$40,152** | **$81,136** | **$159,758** | **$201,196** | **$240,063** | **$283,143** | **$325,778** | **$370,364** |
| YoY % change | | NM | NM | NM | NM | 487% | 102% | 97% | 26% | 19% | 18% | 15% | 14% |

| Geographic Revenue Analysis | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E | 2021E | 2022E | 2023E | 2024E | 2025E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total U.S. Sales, Emricasan | $0 | $0 | $0 | $0 | $0 | $6,332 | $145,969 | $560,216 | $727,103 | $891,977 | $1,054,838 | $1,213,721 | $1,419,666 |
| Total EU Sales, Emricasan | $0 | $0 | $0 | $0 | $45,618 | $261,348 | $394,940 | $504,835 | $614,203 | $708,443 | $832,782 | $958,133 | $1,049,427 |
| **Total Revenue, Emricasan** | **$0** | **$0** | **$0** | **$0** | **$45,618** | **$267,679** | **$540,909** | **$1,065,051** | **$1,341,306** | **$1,600,419** | **$1,887,619** | **$2,171,853** | **$2,469,093** |
| YoY % change | | NM | NM | NM | NM | 487% | 102% | 97% | 26% | 19% | 18% | 15% | 14% |
| | | | | | | | | | | | | | |
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| Risk Adjusted U.S. Sales | $0 | $0 | $0 | $0 | $0 | $950 | $21,895 | $84,032 | $109,065 | $133,796 | $158,226 | $182,058 | $212,950 |
| Risk Adjusted E.U. Sales | $0 | $0 | $0 | $0 | $6,843 | $39,202 | $59,241 | $75,725 | $92,130 | $106,266 | $124,917 | $143,720 | $157,414 |
| **Total Risk Adjusted Sales** | **$0** | **$0** | **$0** | **$0** | **$6,843** | **$40,152** | **$81,136** | **$159,758** | **$201,196** | **$240,063** | **$283,143** | **$325,778** | **$370,364** |
| YoY % change | | NM | NM | NM | NM | 487% | 102% | 97% | 26% | 19% | 18% | 15% | 14% |

Source: STRH estimates, company reports

In addition to CLF, ACLF, and HCV-POLT, other potential indications for emricasan include: NASH, ALD, NAFLD, viral hepatitis, and other chronic liver diseases though we do not include these in our revenue forecast.

## Valuation

Conatus is a clinical stage company unlikely to achieve either revenues or profitability until the latter part of the decade. Therefore, we primarily value the company using a discounted cash flow analysis. Also, the paucity of 2018+ consensus revenue and profitability estimates for most clinical stage and orphan disease companies makes valuing CNAT shares difficult; hence we do not include a peer group comparison in our valuation analysis. Our detailed DCF model and assumptions are detailed below.

## Discounted Cash Flow Analysis

Given that shares of Conatus are comparatively more illiquid and volatile than older, more established and later stage biopharmaceutical companies, we assume a beta of 2.00 relative to the broader market and an equity risk premium of 7.0%. Also, since Conatus has just $1 million outstanding in notes payable, the equity component essentially determines our estimated cost of capital. Our cost of capital assumptions are as follows:

**Exhibit 25: Conatus Cost of Capital Assumptions**

| | |
|---|---|
| Beta (relative to S&P 500) | 2.00 |
| Equity risk premium | 7.00% |
| Risk-free rate | 2.77% |
| **Cost of equity** | **16.77%** |
| | |
| Pre-tax cost of debt | 7.00% |
| Tax rate | 40.00% |
| **After-tax cost of debt** | **4.20%** |
| | |
| **WACC** | **16.69%** |
| **Terminal growth rate** | **1.00%** |

Source: STRH estimates, company reports

We apply the estimated WACC of 16.7% to Conatus's projected free cash flows from the present through the exclusivity period of 2028. Additionally, our model assumes that existing and future net operating losses (NOLs) will total approximately $203 million and will be utilized at a $20 million rate annually beginning in 2018 when we forecast Conatus achieves profitability. Our discounted cash flow estimates are detailed below in Exhibit 26:

**Exhibit 26: Conatus Discounted Cash Flow Analysis – 2013E to 2028**

| ($ in thousands) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| **EBIT** | **(10,847)** | **(25,620)** | **(26,982)** | **(21,513)** | **(12,693)** | **7,899** | **39,808** | **105,152** |
| *EBIT margin* | *N/A* | *N/A* | *N/A* | *N/A* | *(185.5%)* | *19.7%* | *49.1%* | *65.8%* |
| - Taxes | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| + Depreciation & Amortization | 46 | 46 | 46 | 46 | 46 | 99 | 164 | 257 |
| - Change in working capital | 3,770 | 36 | (14) | (14) | (5,597) | (12,532) | (5,109) | (30,845) |
| - Capex | (18) | (18) | (18) | (18) | (18) | (106) | (213) | (420) |
| **Free cash flow** | **(7,048)** | **(25,556)** | **(26,968)** | **(21,499)** | **(18,262)** | **(4,639)** | **34,649** | **74,142** |
| *Discount factor* | *0.94* | *0.81* | *0.69* | *0.59* | *0.51* | *0.44* | *0.37* | *0.32* |
| *Timing adjustment* | *0.4* | *1.4* | *2.4* | *3.4* | *4.4* | *5.4* | *6.4* | *7.4* |
| **Discounted free cash flow** | **(6,643)** | **(20,642)** | **(18,668)** | **(12,754)** | **(9,284)** | **(2,021.3)** | **12,936.7** | **23,723.2** |

Source: STRH estimates, company reports

We estimate the present value of Conatus's 2013E-2028E cash flows at approximately {$140} million and the present value of its estimated terminal value at {$105} million. Exhibit 27 summarizes our estimated DCF analysis:

**Exhibit 27: Conatus DCF Summary Valuation**

| Valuation | |
|---|---|
| PV of DCF (2013E -2028E) | 139,827 |
| PV of terminal value | 105,141 |
| **Firm value** | **$244,968** |
| + Average Cash (2012A-2013E) | 37,558 |
| - Debt + Preferred | 1,000 |
| **Common Equity value** | **$281,526** |
| Diluted Shares outstanding | 16,475 |
| **Value per share** | **$17.09** |
| Current stock price | $9.25 |
| ***Premium / discount to current price*** | ***85%*** |

Source: STRH estimates, company reports

Adjusted for its average 2012A/2013E net cash position, our discounted cash flow valuation analysis of CNAT shares suggests an intrinsic value of approximately $17 per share which represents approximately 85% upside relative to the current price. We would note though that a significant portion of our estimate is derived from: 1) projected cash flows for 2018 and beyond which is the earliest timeframe that we forecast Conatus to become cash flow positive, and 2) the estimated present value of terminal value accounts for a substantial portion of the estimated intrinsic value. Our model also assumes that Conatus will utilize its existing and anticipated net operating losses (NOLs) to offset future tax expenses. Additionally, the projected cash flows in our model could differ materially from our estimate should Conatus fail to garner initial EU and US approval or other subsequent indications for emricasan.

**Discounted Cash Flow Sensitivity Analysis**

We have tested our DCF assumptions below by varying our estimated WACC and terminal growth rates in 50 basis points (bps) increments. Each 50 bps deviation from our estimated WACC geometrically changes the intrinsic value by approximately 8% whereas each 50 bps increment in the assumed terminal growth rate alters the intrinsic value by approximately 2%. Our DCF sensitivity analysis follows in Exhibit 28 below:

**Exhibit 28: Conatus DCF Valuation Sensitivity Analysis**

| | | Terminal Growth | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | (1.00%) | (0.50%) | 0.00% | 0.50% | 1.00% | 1.50% | 2.00% | 2.50% | 3.00% |
| WACC | 14.7% | $21.33 | $21.64 | $21.97 | $22.33 | $22.71 | $23.12 | $23.56 | $24.04 | $24.56 |
| | 15.2% | $19.89 | $20.17 | $20.46 | $20.77 | $21.11 | $21.47 | $21.85 | $22.27 | $22.72 |
| | 15.7% | $18.58 | $18.82 | $19.08 | $19.35 | $19.65 | $19.96 | $20.30 | $20.66 | $21.05 |
| | 16.2% | $17.37 | $17.58 | $17.81 | $18.05 | $18.31 | $18.59 | $18.88 | $19.20 | $19.54 |
| | 16.7% | $16.25 | $16.44 | $16.65 | $16.86 | **$17.09** | $17.33 | $17.59 | $17.87 | $18.16 |
| | 17.2% | $15.23 | $15.39 | $15.57 | $15.76 | $15.96 | $16.18 | $16.41 | $16.65 | $16.91 |
| | 17.7% | $14.28 | $14.43 | $14.58 | $14.75 | $14.93 | $15.12 | $15.32 | $15.54 | $15.77 |
| | 18.2% | $13.40 | $13.53 | $13.67 | $13.82 | $13.98 | $14.15 | $14.33 | $14.52 | $14.72 |
| | 18.7% | $12.58 | $12.70 | $12.83 | $12.96 | $13.10 | $13.25 | $13.41 | $13.58 | $13.76 |

Source: STRH estimates

**Intellectual Property**

Currently, Conatus has patents comprising composition of matter, method of use, and polymorph composition of matter and method patents for emricasan. A summary of the key patents in the company's estate is included in Exhibit 29. The company's patent portfolio contains over 40 U.S. patents, not including applications. Although the composition of matter and method of use patents expire in 2017 in the EU and 2018 in the US, the company still has polymorph composition of matter and method patents that do not expire until 2027 in the EU and 2028 in the US. Despite the generalized view that patents protecting polymorphs are not as strong as patents covering the original drug, there is precedence and case law of polymorph patents successfully extending periods of exclusivity. In addition, both the composition of matter patent and polymorph composition of matter and method patent are eligible for patent term extensions under EU and US law.

**Exhibit 29: Key Conatus Patents and Expiries**

**Conatus Pharmaceuticals Inc., Summary of Key Emricasan Patents**

| Patent No. | Patent | Description | Expiry |
|---|---|---|---|
| EP 1 091 930 | Composition of matter (EU) | The pharmaceutical compositions of C-terminal modified oxamyl dipeptides as inhibitors of the ICE/CED-3 family of cysteine proteases | 2017 |
| US 6,197,750* | Composition of matter (US) | The pharmaceutical compositions of C-terminal modified oxamyl dipeptides as inhibitors of the ICE/CED-3 family of cysteine proteases | 2018 |
| EP 1 754 475 | Methods of use (EU) | A method for treating hepatitis, comprising administering pharmaceutical compositions of modified oxamyl dipeptides as inhibitors of the ICE/CED-3 family of cysteine proteases | 2017 |
| US 7,183,260 | Methods of use (US) | A method for treating hepatitis, comprising administering pharmaceutical compositions of modified oxamyl dipeptides as inhibitors of the ICE/CED-3 family of cysteine proteases | 2018 |
| EP 2 091 910 | Polymorph Comp. and Method (EU) | The crystalline form of IDN-6556 and the pharmaceutical compositions comprising such crystalline forms and method of treating liver fibrosis | 2027 |
| US 7,692,038* | Polymorph Comp. and Method (US) | The crystalline form of IDN-6556 and the pharmaceutical compositions comprising such crystalline forms and method of treating liver fibrosis | 2028 |

*Eligible for extensions

Source: STRH estimates, company reports

In our view, the key intellectual property issue for Conatus is the strength of its EU (EP '910) and US (US '038) polymorph patents as the base composition of matter patents are scheduled to expire at the time of anticipated commercial launch (excluding potential extensions). Should Conatus garner approval and execute a successful launch, we would assume that generic competitors will scrutinize the EP '910 and US '038 patents for potential challenges.

Given the various delays and clinical holds that have been placed on emricasan, Conatus could also potentially apply for patent extensions under the Drug Price Competition and Patent Term Restoration Act, which is informally known as the Hatch-Waxman Act. We currently do not model Hatch-Waxman extensions to the patent expiries listed in Exhibit 29 given low visibility on exact development and regulatory review timeframes but they could potentially take the patent estate to well beyond 2028.

Moreover, we anticipate that Conatus could develop a specialized network that will tightly control the distribution of emricasan. We view this as achievable for Conatus as there are established precedents such as Celgene Corporation's (CELG) specialized distribution network for Revlimid (lenalidomide) and Jazz Pharmaceuticals' (JAZZ) distribution network for Xyrem, which have patent estates protecting how they are used in the oncology and narcolepsy setting, respectively. A patented distribution network should create additional barriers to entry against potential competitors, which reinforces our conviction in Conatus's ability to retain exclusivity through 2028.

## Appendix: Conatus Pharmaceuticals, Inc.

### Institutional Ownership

In Exhibit 30, we present significant Conatus shareholders and their positions. Given Conatus's limited history as a public company, Form 13 holders have not yet been required to disclose their holdings.

**Exhibit 30: Conatus Significant Form 3 and Form 4 Shareholders**

| Firm/Entity | Shares (M) | % Outstanding |
|---|---|---|
| Aberdare Ventures | 2.2 | 13.4 |
| Advent Private Equity | 2.0 | 12.1 |
| Coöperative Gilde Healthcare II U.A. | 1.3 | 7.9 |
| MPM Capital | 1.1 | 6.7 |
| AgeChem Venture Fund L.P. | 0.7 | 4.2 |
| Roche Financial Ltd | 0.6 | 3.6 |

Source: STRH estimates, company reports

### Management and Corporate Governance

The Conatus management team is composed of many of the same members of the team at Idun that discovered and led the early development of emricasan. Furthermore, the team includes Dr. Gary C. Burgess who was also part of the emricasan development team at both Idun and Pfizer. We think the continuity and experience of the management team lowers execution risk and underscores their commitment and belief in the potential of the emricasan opportunity

**Exhibit 31: Conatus Pharmaceuticals Inc. Senior Management**

| Name | Position | Previous Affiliation(s) |
|---|---|---|
| Steven J. Mento, Ph.D | Co-founder, President, and CEO | President and CEO, Idun Pharmaceuticals; President, Chiron Viagene; VP of R&D, Viagene; Director of Viral Vaccine R&D at Lederle-Praxis Biologicals |
| Alfred P. Spada, Ph.D. | Co-founder, SVP R&D, and CSO | VP of Pharm. & Preclin. Dev., Idun Pharmaceuticals; Dept. Director of Med. and Analytical Chemistry, Aventis |
| Gary C. Burgess M.B., Ch.B. M.Med.(Int.)(Stell.) | SVP Clinical Research and CMO | Clinical Program Leader for emricasan, Pfizer; Senior Director and Clinical Portfolio Lead (Asia), Pfizer; Med. Dev. Team Leader for Thelin, Pfizer |
| Charles J. Cashion | Co-founder, SVP Finance, and CFO | SVP of Finance and CFO, Idun Pharmaceuticals; SVP and CFO, Quidel; SVP and CFO, Immune Response; EVP and CFO, Smith Laboratories; President and CEO, Sutter |

Source: STRH estimates, company reports

**Exhibit 32: Conatus Pharmaceuticals Inc., Board of Directors**

| Name | Position and Affiliation |
|---|---|
| Steven J. Mento, Ph.D | Co-founder, President, and CEO, Conatus Pharmaceuticals |
| David F. Hale | Chairman and CEO, Hale BioPharma Ventures |
| Paul H. Klingenstein | Managing Partner, Aberdare Ventures |
| Louis Lacasse | President, GeneChem Management Inc.; Managing Partner, AgeChem Financial Inc. |
| Shahzad Malik, M.D. | General Partner, Advent Venture Partners |
| Marc Perret | Managing Partner, Gilde Healthcare Partners |
| Jim Scopa, JD, MBA | Managing Director, MPM Capital |
| Harold Van Wart, Ph.D. | CEO, Metabolex, Inc. |

Source: STRH estimates, company reports

## Exhibit 33a: Conatus Pharmaceuticals CLF Revenue Model – 2013E to 2020E

**CLF**

| CLF (U.S.) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| CLF population | 4,000 | 4,004 | 4,008 | 4,012 | 4,016 | 4,020 | 4,024 | 4,028 |
| YoY% Change in Population | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 4,000 | 4,004 | 4,008 | 4,012 | 4,016 | 4,020 | 4,024 | 4,028 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.0% | 21.0% | 27.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 603 | 845 | 1,088 |
| Monthly cost (Dollars '000) | $10 | $10 | $10 | $10 | $10 | $11 | $11 | $12 |
| Duration (1-3 months) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.1 | 1.1 |
| **Total U.S. sales - CLF ('000)** | **$0** | **$0** | **$0** | **$0** | **$0** | **$6,332** | **$9,810** | **$13,925** |
| YoY % change | | NM | NM | NM | NM | NM | 55% | 42% |

**CLF**

| CLF (EU) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| CLF population | 6,000 | 6,006 | 6,012 | 6,018 | 6,024 | 6,030 | 6,036 | 6,042 |
| YoY% Change in Population | 0.0% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 6,000 | 6,006 | 6,012 | 6,018 | 6,024 | 6,030 | 6,036 | 6,042 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 7.0% | 12.5% | 18.0% | 23.5% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 422 | 754 | 1,086 | 1,420 |
| Monthly cost (Dollars '000) | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 |
| Duration (1-3 months) | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 1.1 | 1.1 | 1.2 |
| **Total EU sales - CLF ('000)** | **$0** | **$0** | **$0** | **$0** | **$2,952** | **$5,556** | **$8,412** | **$11,520** |
| YoY % change | | NM | NM | NM | NM | 88% | 51% | 37% |

| CLF | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Sales - CLF** | **$0** | **$0** | **$0** | **$0** | **$443** | **$1,783** | **$2,733** | **$3,817** |
| YoY % change | | NM | NM | NM | NM | 303% | 53% | 40% |

Source: STRH estimates, company reports

## Exhibit 33b: Conatus Pharmaceuticals ACLF Revenue Model – 2013E to 2020E

**ACLF**

| ACLF (U.S.) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| ACLF population[1] | 63,739 | 63,803 | 63,867 | 63,930 | 63,994 | 64,058 | 64,122 | 64,187 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 63,739 | 63,803 | 63,867 | 63,930 | 63,994 | 64,058 | 64,122 | 64,187 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.0% | 21.0% | 27.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 9,609 | 13,466 | 17,330 |
| Monthly cost (Dollars '000) | $10 | $10 | $10 | $10 | $10 | $11 | $11 | $12 |
| Duration (1-6 months) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 1.5 |
| **Total U.S. sales - ACLF** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$136,158** | **$306,663** |
| YoY % change | | NM | NM | NM | NM | NM | NM | 125% |

**ACLF**

| ACLF (EU) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| ACLF population* | 86,261 | 88,771 | 91,354 | 94,013 | 96,749 | 99,564 | 102,461 | 105,443 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 86,261 | 88,771 | 91,354 | 94,013 | 96,749 | 99,564 | 102,461 | 105,443 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 7.0% | 13.5% | 20.0% | 26.5% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 6,772 | 13,441 | 20,492 | 27,942 |
| Monthly cost (Dollars '000) | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 |
| Duration (1-6 months) | 0.0 | 0.0 | 0.0 | 0.0 | 0.9 | 1.5 | 1.5 | 1.5 |
| **Total EU sales - ACLF** | **$0** | **$0** | **$0** | **$0** | **$42,666** | **$141,132** | **$215,169** | **$293,395** |
| YoY % change | | NM | NM | NM | NM | 231% | 52% | 36% |

| ACLF | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Sales - ACLF** | **$0** | **$0** | **$0** | **$0** | **$6,400** | **$21,170** | **$52,699** | **$90,009** |
| YoY % change | | NM | NM | NM | NM | 231% | 149% | 71% |

Source: STRH estimates, company reports

## Exhibit 33c: Conatus Pharmaceuticals HCV-POLT Revenue Model – 2013E to 2020E

**HCV-POLT**

| HCV-POLT (U.S.) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| HCV-POLT population | 21,500 | 21,550 | 21,575 | 21,575 | 19,000 | 16,500 | 13,500 | 11,500 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 21,500 | 21,550 | 21,575 | 21,575 | 19,000 | 16,500 | 13,500 | 11,500 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,725 |
| Monthly cost (Dollars '000) | $10 | $10 | $10 | $10 | $10 | $11 | $11 | $12 |
| Duration (2 yrs - life) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 |
| **Total U.S. Sales - HCV-POLT** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$239,628** |
| YoY % change | | NM | NM | NM | NM | NM | NM | NM |

**HCV-POLT**

| HCV-POLT (EU) | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| HCV-POLT population | 24,500 | 25,000 | 25,000 | 25,550 | 21,050 | 19,500 | 17,000 | 14,000 |
| % Eligible for Emricasan | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Estimated Emricasan population | 24,500 | 25,000 | 25,000 | 25,550 | 21,050 | 19,500 | 17,000 | 14,000 |
| % Receiving Emricasan | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 7.0% | 12.0% | 17.0% |
| Estimated population receiving Emricasan | 0 | 0 | 0 | 0 | 0 | 1,365 | 2,040 | 2,380 |
| Monthly cost (Dollars '000) | $7 | $7 | $7 | $7 | $7 | $7 | $7 | $7 |
| Duration (2 yrs - life) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 12.0 | 12.0 | 12.0 |
| **Total EU Sales - HCV-POLT** | **$0** | **$0** | **$0** | **$0** | **$0** | **$114,660** | **$171,360** | **$199,920** |
| YoY % change | | NM | NM | NM | NM | NM | 49% | 17% |

| HCV-POLT | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Sales - HCV-POLT** | **$0** | **$0** | **$0** | **$0** | **$0** | **$17,199** | **$25,704** | **$65,932** |
| YoY % change | | NM | NM | NM | NM | NM | 49% | 157% |

| CLF + ACLF + HCV-POLT Sales | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| **Unadjusted Total Sales - Emricasan** | **$0** | **$0** | **$0** | **$0** | **$45,618** | **$267,679** | **$540,909** | **$1,065,051** |
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| **Total Risk Adjusted Emricasan Sales ('000)** | **$0** | **$0** | **$0** | **$0** | **$6,843** | **$40,152** | **$81,136** | **$159,758** |
| YoY % change | | NM | NM | NM | NM | 487% | 102% | 97% |

| Geographic Revenue Analysis | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|
| Total U.S. Sales, Emricasan | $0 | $0 | $0 | $0 | $0 | $6,332 | $145,969 | $560,216 |
| Total EU Sales, Emricasan | $0 | $0 | $0 | $0 | $45,618 | $261,348 | $394,940 | $504,835 |
| **Total Revenue, Emricasan** | **$0** | **$0** | **$0** | **$0** | **$45,618** | **$267,679** | **$540,909** | **$1,065,051** |
| YoY % change | | NM | NM | NM | NM | 487% | 102% | 97% |
| | | | | | | | | |
| Risk Adjustment | 15% | 15% | 15% | 15% | 15% | 15% | 15% | 15% |
| Risk Adjusted U.S. Sales | $0 | $0 | $0 | $0 | $0 | $950 | $21,895 | $84,032 |
| Risk Adjusted E.U. Sales | $0 | $0 | $0 | $0 | $6,843 | $39,202 | $59,241 | $75,725 |
| **Total Risk Adjusted Sales** | **$0** | **$0** | **$0** | **$0** | **$6,843** | **$40,152** | **$81,136** | **$159,758** |
| YoY % change | | NM | NM | NM | NM | 487% | 102% | 97% |

Source: STRH estimates, company reports

## Exhibit 34: Conatus Pharmaceuticals Profit and Loss Model – 2011A to 2020E

| ($ in thousands, except per share data) | 2011A | 2012A | 1Q13A | 2Q13E | 3Q13E | 4Q13E | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total risk-adjusted revenue** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$6,843** | **$40,152** | **$81,136** | **$159,758** |
| Cost of goods sold ($20K/kilo) | 0 | 0 | | | | | 0 | 0 | 0 | 0 | 1,026 | 6,023 | 12,170 | 23,964 |
| **Gross profit** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$0** | **$5,816** | **$34,129** | **$68,966** | **$135,794** |
| Research & Development | 9,487 | 5,528 | 968 | 470 | 1,485 | 2,455 | 5,378 | 18,400 | 19,380 | 15,350 | 5,474 | 5,822 | 6,897 | 6,390 |
| Total SG&A | 2,875 | 3,086 | 749 | 1,540 | 1,540 | 1,640 | 5,469 | 7,220 | 7,602 | 6,163 | 13,035 | 20,409 | 22,261 | 24,252 |
| Total expenses | $12,361 | $8,615 | $1,717 | $2,010 | $3,025 | $4,095 | $10,847 | $25,620 | $26,982 | $21,513 | $18,509 | $26,231 | $29,158 | $30,642 |
| **Operating Profit (Loss)** | **($12,361)** | **($8,615)** | **($1,717)** | **($2,010)** | **($3,025)** | **($4,095)** | **($10,847)** | **($25,620)** | **($26,982)** | **($21,513)** | **($12,693)** | **$7,899** | **$39,808** | **$105,152** |
| Interest Income | $28 | $26 | 0 | 0 | 47 | 47 | $188 | $293 | $264 | $245 | $148 | $97 | $188 | $489 |
| Interest Expense | (114) | (70) | (18) | (18) | (18) | (18) | (70) | (70) | (70) | (70) | (70) | (70) | (70) | (35) |
| Other Income (Expense) | 450 | (90) | (563) | | | | (563) | 0 | 0 | 0 | (6,000) | (6,000) | 0 | 0 |
| (Loss) gain on change in fair value of warrant liability | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Pretax Income (Loss)** | **($11,997)** | **($8,749)** | **($2,297)** | **($2,027)** | **($2,996)** | **($4,066)** | **($11,292)** | **($25,397)** | **($26,789)** | **($21,338)** | **($18,615)** | **$1,926** | **$39,926** | **$105,606** |
| Tax Expense (Benefit) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Net Income (Loss)** | **($11,997)** | **($8,749)** | **($2,297)** | **($2,027)** | **($2,996)** | **($4,066)** | **($11,292)** | **($25,397)** | **($26,789)** | **($21,338)** | **($18,615)** | **$1,926** | **$39,926** | **$105,606** |
| EPS - basic | | ($0.95) | ($0.25) | ($0.22) | ($0.18) | ($0.25) | ($0.88) | ($1.54) | ($1.30) | ($1.03) | ($0.90) | $0.09 | $1.93 | $5.11 |
| **EPS - diluted** | **($1.44)** | **($0.95)** | **($0.25)** | **($0.22)** | **($0.18)** | **($0.25)** | **($0.88)** | **($1.54)** | **($1.30)** | **($1.03)** | **($0.90)** | **$0.09** | **$1.93** | **$5.11** |
| Basic share outstanding | | 9,255 | 9,299 | 9,299 | 16,475 | 16,475 | 12,887 | 16,475 | 20,686 | 20,686 | 20,686 | 20,686 | 20,686 | 20,686 |
| Diluted shares outstanding | 8,342 | 9,255 | 9,299 | 9,299 | 16,475 | 16,475 | 12,887 | 16,475 | 20,686 | 20,686 | 20,686 | 20,686 | 20,686 | 20,686 |

| **Margin analysis** | **2011A** | **2012A** | **1Q13A** | **2Q13E** | **3Q13E** | **4Q13E** | **2013E** | **2014E** | **2015E** | **2016E** | **2017E** | **2018E** | **2019E** | **2020E** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross margin (on sales) | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 85.0% | 85.0% | 85.0% | 85.0% |
| Research & Development | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 80.0% | 14.5% | 8.5% | 4.0% |
| General & Administrative | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 94.5% | 18.8% | 10.8% | 6.3% |
| Sales & Marketing | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 96.0% | 32.0% | 16.6% | 8.9% |
| Total SG&A | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 190.5% | 50.8% | 27.4% | 15.2% |
| **Operating profit** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **-185.5%** | **19.7%** | **49.1%** | **65.8%** |
| Pretax income | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | -272.0% | 4.8% | 49.2% | 66.1% |
| Effective tax rate | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | 0.0% | 0.0% | 0.0% |
| **Net income** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **-272.0%** | **4.8%** | **49.2%** | **66.1%** |

| **YoY % change** | **2011A** | **2012A** | **1Q13A** | **2Q13E** | **3Q13E** | **4Q13E** | **2013E** | **2014E** | **2015E** | **2016E** | **2017E** | **2018E** | **2019E** | **2020E** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Total risk-adjusted revenue** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **486.8%** | **102.1%** | **96.9%** |
| Gross Profit | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **NM** | **486.8%** | **102.1%** | **96.9%** |
| Research & Development | NM | -41.7% | -16.7% | NM | NM | NM | -2.7% | 242.1% | 5.3% | -20.8% | -64.3% | 6.4% | 18.5% | -7.3% |
| General & Administrative | NM | 7.4% | -0.2% | NM | NM | NM | 77.2% | 20.1% | 6.0% | 5.8% | 18.0% | 17.0% | 16.0% | 15.0% |
| Sales & Marketing | NM | NM | NM | NM | NM | NM | NM | NM | 5.0% | 0.0% | 862.3% | 95.5% | 5.0% | 5.0% |
| Total SG&A | NM | 7.4% | | | | | 77.2% | 32.0% | 5.3% | -18.9% | 111.5% | 56.6% | 9.1% | 8.9% |
| **Operating profit** | **NM** | **-30.3%** | | | | | **25.9%** | **136.2%** | **5.3%** | **-20.3%** | **-41.0%** | **-162.2%** | **404.0%** | **164.1%** |
| Pretax income | NM | -27.1% | 20.7% | NM | NM | NM | 29.1% | 124.9% | 5.5% | -20.3% | -12.8% | -110.3% | 1972.9% | 164.5% |
| Tax Expense (Benefit) | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM | NM |
| Net Income (Loss) | NM | -27.1% | 20.7% | NM | NM | NM | 29.1% | 124.9% | 5.5% | -20.3% | -12.8% | -110.3% | 1972.9% | 164.5% |
| **EPS - diluted** | **NM** | **-34.3%** | **20.2%** | **NM** | **NM** | **NM** | **-7.3%** | **75.9%** | **-16.0%** | **-20.3%** | **-12.8%** | **-110.3%** | **1972.9%** | **164.5%** |

Source: STRH estimates, company reports

## Exhibit 35: Conatus Pharmaceuticals Balance Sheet Model – 2011A to 2020E

| *($ in thousands except per share data)* | 2011A | 2012A | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|---|---|
| **Assets** | | | | | | | | | | |
| Cash and cash equivalents | $3,073 | $4,036 | $71,079 | $46,009 | $59,514 | $38,489 | $14,770 | $6,221 | $45,092 | $126,687 |
| Short-term investments | 13,685 | 3,989 | 219 | 184 | 148 | 112 | 77 | 41 | 5 | 0 |
| Accounts and trade receivables | 0 | 0 | 0 | 0 | 0 | 0 | 4,106 | 20,076 | 32,455 | 55,915 |
| Inventories | 0 | 0 | 0 | 0 | 50 | 100 | 667 | 3,313 | 5,477 | 9,825 |
| Prepaid and other current assets | 165 | 76 | 76 | 76 | 76 | 76 | 342 | 2,008 | 4,057 | 7,988 |
| **Total current assets** | **$16,923** | **$8,102** | **$71,375** | **$46,269** | **$59,788** | **$38,778** | **$19,961** | **$31,657** | **$87,085** | **$200,415** |
| Property and equipment, net | $21 | $30 | $37 | $44 | $51 | $58 | $66 | $108 | $193 | $362 |
| Deferred tax assets | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other noncurrent assets | 14 | 14 | 40 | 40 | 40 | 40 | 7 | 40 | 81 | 160 |
| Total noncurrent assets | $36 | $44 | $77 | $84 | $92 | $99 | $72 | $148 | $275 | $521 |
| **Total assets** | **$16,959** | **$8,146** | **$71,452** | **$46,353** | **$59,880** | **$38,877** | **$20,034** | **$31,805** | **$87,360** | **$200,937** |
| **Liabilities and Stockholders' Equity** | | | | | | | | | | |
| ***Current Liabilities:*** | | | | | | | | | | |
| Short-term debt | $0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1,000 | 0 |
| Accounts payable & accrued expenses | $1,179 | 1,087 | 1,087 | 1,087 | 1,087 | 1,087 | 513 | 2,409 | 3,651 | 4,793 |
| Accrued compensation | 542 | 326 | 326 | 326 | 326 | 326 | 205 | 6,023 | 16,227 | 15,976 |
| **Total current liabilities** | **$1,721** | **$1,413** | **$1,413** | **$1,413** | **$1,413** | **$1,413** | **$718** | **$8,432** | **$20,878** | **$20,768** |
| Preferred stock warrant liability | 69 | 160 | 160 | 157 | 154 | 151 | 148 | 145 | 142 | 139 |
| Note payable | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total liabilities** | **$2,790** | **$2,573** | **$2,573** | **$2,570** | **$2,567** | **$2,564** | **$1,866** | **$9,577** | **$21,020** | **$20,908** |
| ***Stockholders' Equity:*** | | | | | | | | | | |
| Common Stock (Series A) | $32,209 | $32,209 | $102,954 | $103,128 | $143,320 | $143,531 | $143,873 | $145,881 | $149,937 | $157,925 |
| Common Stock (Series B) | 31,700 | 31,700 | 31,700 | 31,700 | 31,700 | 31,700 | 31,700 | 31,700 | 31,700 | 31,700 |
| Common Stock | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Additional paid-in capital | 323 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 | 470 |
| Accumulated other comprehensive income (deficit) | (4) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| (Deficit)/Earnings accumulated | (50,058) | (58,808) | (66,247) | (91,517) | (118,178) | (139,389) | (157,877) | (155,824) | (115,770) | (10,068) |
| **Total stockholders' equity (deficit)** | **$14,169** | **$5,573** | **$68,879** | **$43,783** | **$57,313** | **$36,313** | **$18,167** | **$22,228** | **$66,339** | **$180,029** |
| **Total liabilities and stockholders' equity (deficit)** | **$16,959** | **$8,146** | **$71,452** | **$46,353** | **$59,880** | **$38,877** | **$20,034** | **$31,805** | **$87,360** | **$200,937** |

Source: STRH estimates, company reports

## Exhibit 36: Conatus Pharmaceuticals Statement of Cash Flows Model - – 2012A to 2020E

| *($ in thousands except per share data)* | 2012A | 2013E | 2014E | 2015E | 2016E | 2017E | 2018E | 2019E | 2020E |
|---|---|---|---|---|---|---|---|---|---|
| **Cash flows from operating activities:** | | | | | | | | | |
| Net Income (loss) | ($8,749) | ($11,292) | ($25,397) | ($26,789) | ($21,338) | ($18,615) | $1,926 | $39,926 | $105,606 |
| Depreciation and amortization | 181 | 46 | 46 | 46 | 46 | 46 | 99 | 164 | 257 |
| Stock-based compensation expense | 144 | 158 | 174 | 192 | 211 | 342 | 2,008 | 4,057 | 7,988 |
| Loss (gain) on changes in fair value of warrant liability | | 0 | (3) | (3) | (3) | (3) | (3) | (3) | (3) |
| Deferred income taxes | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Change in lease liability | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| Changes in assets and liabilities: | | | | | | | | | |
| Short term investments | | 3,770 | 36 | 36 | 36 | 36 | 36 | 36 | 5 |
| Accounts and trade receivables | | 0 | 0 | 0 | 0 | (4,106) | (15,970) | (12,379) | (23,461) |
| Inventories | | 0 | 0 | (50) | (50) | (567) | (2,645) | (2,164) | (4,348) |
| Prepaid expenses & other current assets | 89 | 0 | 0 | 0 | 0 | (266) | (1,665) | (2,049) | (3,931) |
| Deferred tax assets | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other non-current assets | 0 | (26) | 0 | 0 | 0 | 33 | (33) | (41) | (79) |
| Accounts payable and other current liabilities | (92) | 0 | 0 | 0 | 0 | (694) | 7,713 | 11,447 | 890 |
| Other long-term liabilities | (229) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net cash generated (used) in operating activities | ($8,564) | ($7,251) | ($25,052) | ($26,476) | ($21,007) | ($23,702) | ($8,443) | $39,085 | $83,015 |
| **Cash flows from investing activities:** | | | | | | | | | |
| Maturities of investments | $19,838 | $3,725 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Purchases of investments | (10,309) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Capital Expenditures | (18) | (18) | (18) | (18) | (18) | (18) | (106) | (213) | (420) |
| Net cash generated (used) in investing activities | $9,511 | $3,707 | ($18) | ($18) | ($18) | ($18) | ($106) | ($213) | ($420) |
| **Cash flows from financing activities:** | | | | | | | | | |
| Short-term borrowings | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $1,000 | ($1,000) |
| Proceeds from issuance of common stock | 16 | 70,587 | 0 | 40,000 | 0 | 0 | 0 | 0 | 0 |
| Proceeds from exercise of stock options / warrants (net of costs) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Share repurchase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Proceeds from issuance of debt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | (1,000) | 0 |
| Repayment of debt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Repayment of finance leases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Net cash flow provided (used) by financing activities | $16 | $70,587 | $0 | $40,000 | $0 | $0 | $0 | $0 | ($1,000) |
| **Net increase (decrease) in cash and cash equivalents** | **$963** | **$67,043** | **($25,070)** | **$13,506** | **($21,025)** | **($23,720)** | **($8,549)** | **$38,872** | **$81,595** |
| Cash and cash equivalents, beginning of period | $3,073 | $4,036 | $71,079 | $46,009 | $59,514 | $38,489 | $14,770 | $6,221 | $45,092 |
| **Cash and cash equivalents, end of period** | **$4,036** | **$71,079** | **$46,009** | **$59,514** | **$38,489** | **$14,770** | **$6,221** | **$45,092** | **$126,687** |

Source: STRH estimates, company reports

## Investment Thesis

We rate (CNAT) a Buy with a $17 price target given its attractive risk-reward based on our conservative revenue and DCF assumptions. Our valuation analysis applies a significant discount rate appropriate for early clinical-stage companies to our heavily risk adjusted revenue and cash flow estimates, which suggests that CNAT's shares are undervalued. We view CNAT as a pioneer in the development of its 1st-in-class oral caspase protease inhibitor, emricasan, for treating liver disease & fibrosis. We view the clinical development and regulatory risks as high due to the challenging patient population. CNAT has attempted to minimize this risk through the favorable histological data that it has presented and pre-clinical studies that have had some conflicting results in key biomarkers for cell death and inflammation. On the regulatory front, there is uncertainty on the use of surrogate endpoints in liver disease clinical trials and their potential clinical utility in a patient population that frequently has other co-morbidities and high mortality rates. In Europe, regulators have expressed greater acceptance of surrogate endpoints in orphan liver trials, while in the US Conatus remains in ongoing discussions with the FDA regarding clinical trial design for emricasan. Our model assumes initial EU launches in chronic liver failure (CLF) & acute-on-chronic liver failure (ACLF) in 2017E, & Hepatitis C virus-related post-orthotopic liver transplant (HCV-POLT) in 2018E. In the US, we assume a CLF launch in 2018E, ACLF in 2019E & HCV-POLT in 2020E. However, given that lack of a clear pathway to US approval, Conatus could potentially be required to conduct additional trials which would not only result in longer timelines than we have modeled but also greater capital requirements. We view the commercial risk as low and offering a high degree of operating leverage since only 16/12 US/EU sales representatives would be needed to cover >90% of the liver transplant centers. In addition, the three potential orphan disease populations targeted have a high unmet medical need and represent a large market opportunity through the US/EU exclusivity periods of 2028/2027 withstanding any patent challenges and excluding any extensions. If Conatus is able to navigate the clinical and regulatory risks for emricasan, our 15 % risk adjustment to our $430M revenue assumption in 2028E could prove to be overly conservative. Consequently, any upward revision to our sales forecast would have material upside to Conatusâ€™s earnings power as well as its intrinsic value.

## Company Description

Conatus Pharmaceuticals, Inc. is a clinical-stage biotechnology company focused on developing drugs to treat liver diseases. The company's lead compound, emricasan, is a first-in-class, orally active pan-caspase inhibitor designed to reduce inflammation and cell death, thereby disrupting the pathway leading to liver fibrosis and cirrhosis. The company is currently focused on developing emricasan for the treatment of patients with acute-on-chronic liver failure (ACLF), chronic liver failure (CLF), and HCV-related post-orthotopic liver transplants (HCV-POLT). In 2005, Pfizer acquired emricasan from Idun Pharmaceuticals (Conatusâ€™s predecessor company). In 2010, Conatus re-acquired emricasan from Pfizer and is continuing to develop it through the clinical stage process.

## Analyst Certification

I, John T. Boris, hereby certify that the views expressed in this research report accurately reflect my personal views about the subject company(ies) and its (their) securities. I also certify that I have not been, am not, and will not be receiving direct or indirect compensation in exchange for expressing the specific recommendation(s) in this report.

## Important Disclosures

- SunTrust Robinson Humphrey, Inc. managed or co-managed a securities offering for the following companies within the last 12 months: Conatus Pharmaceuticals Inc.
- The following companies are clients of SunTrust Robinson Humphrey, Inc. and the firm has received or is entitled to receive compensation for investment banking services involving their securities within the last 12 months: Conatus Pharmaceuticals Inc.
- SunTrust Robinson Humphrey, Inc. makes a market in the following companies at the time of this report: Conatus Pharmaceuticals Inc.

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| Rating And Price Target History (CNAT) | | | |
|---|---|---|---|
| **Date** | **Rating** | **Target** | **Closing** |
| No changes made in the prior three years. | | | |

## Definition of Ratings

SunTrust Robinson Humphrey assigns one of three ratings to stocks covered by our Research Department: **Buy, Neutral, or Reduce.**

In addition, we assign a risk rank to each stock based on a combination of fundamental and stock volatility factors:
**Low** = Low stock price volatility reflected by high predictability of financial results.
**Moderate** = Moderate stock price volatility reflected by medium predictability of financial results.
**High** = High stock price volatility reflected by inconsistent predictability of financial results.
**Speculative** = Greatest stock price volatility reflected by low predictability of financial results.
**Venture** = Recommended only for maximum risk oriented and well-diversified portfolios.

Our ratings are a function of the risk ranking (higher return expectations for higher risk) and the absolute expected total return (price appreciation plus dividends) that result in our estimated 12-month price target. Please refer to the grid below for additional detail.

| Performance Definition Scale | | | | |
|---|---|---|---|---|
| *Total return (capital gain/loss + dividends) expected over the next 12 months* | | | | |
| **Rating** | **Low Risk** | **Moderate Risk** | **High Risk** | **Speculative** |
| Buy | Over 10% | Over 15% | Over 20% | Over 25% |
| Neutral | -5% to 10% | -5% to 15% | -10% to 20% | -10% to 25% |
| Reduce | -5% or Worse | -5% or Worse | -10% or Worse | -10% or Worse |

SunTrust Robinson Humphrey assigns one of three ratings to industries/sectors covered by our Research Department: Overweight, Market Weight or Underweight. These terms are relative to the appropriate S&P 500 industries/sectors.

Deviations from expected price targets due to price movement and/or volatility will be reviewed by the analyst and research management on a timely basis. Price targets are only required on Buy rated stocks; the analyst may choose to have price targets on Neutral or Reduce rated stocks, but it is not required. Action taken by an investor should be based upon their personal investment objectives and risk tolerance compared to a stock's expected performance and risk ranking.

**SunTrust Robinson Humphrey ratings distribution as of 08/16/2013:**

| Coverage Universe | | |
|---|---|---|
| **Rating** | **Count** | **Percent** |
| Buy | 188 | 48 |
| Hold/Neutral | 195 | 50 |
| Sell/Reduce | 10 | 3 |

| Investment Banking Clients Past 12 months | | |
|---|---|---|
| **Rating** | **Count** | **Percent*** |
| Buy | 55 | 14 |
| Hold/Neutral | 34 | 9 |
| Sell/Reduce | 0 | 0 |

*Percentage of Investment Banking clients in Coverage Universe by rating

## Financial Definitions

Average Daily Volume = The cumulative number of shares traded over 200 days ÷ number of trading sessions in that period
Book Value/Share = Shareholders' equity ÷ shares outstanding
Debt/Cap. = Debt ÷ shareholders' equity + debt
Debt/EBITDA = Long-term debt ÷ earnings before interest, tax, depreciation, and amortization
Dividend/Yield = Annual dividend per share ÷ share price
Est. 5-Year EPS Growth = Expected 5-year CAGR from latest actual
Float = Number of shares outstanding available for public trading
Free Cash Flow/Share = Trailing four quarters cash flow from operations - yearly CAPEX ÷ shares outstanding
Long-Term Debt = Loans and financial obligations extending beyond one year
Net Cash/Share = Cash + liquid securities - total debt (short and long term) ÷ shares outstanding
ROE (last year actual) = Net income ÷ shareholders' equity
Shareholders' Equity = Share capital + retained earnings - treasury shares

**Key Indices:**
DJIA – Dow Jones
RUI – Russell 1000
RUT – Russell 2000
MID – S&P MidCap 400
SPX – S&P 500
SML – S&P SmallCap 600

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