TWO SIGMA

Street View

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BY JEFFREY N. SARET & GERARDO MANZO

EXECUTIVE SUMMARY The Greek government requires more support from the so-called Troika to pay back loans maturing in July, and the IMF argues that Greece remains a "good distance away from having a coherent program" that the IMF would approve for further funding. Greek CDS spreads have approached a level (2000 bps) on par with last summer's crisis. The usual list of sovereign debt markets (e.g., Italy, Spain, and France) continues to have relatively high correlations (>30 percent) to Greek CDS.

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Inside:
Another Greek Rock Roll

ANOTHER GREEK ROCK ROLL

Among his many transgressions, the mythological Sisyphus earned the ire of the Greek gods for enchaining Death. In punishment for trying to upend the natural order, Sisyphus suffered an eternity of rolling a rock up a hill, only to see it tumble down each time.

Numerous other analyses of the Greek economy have drawn parallels to Sisyphus' story, and for good reason. Multiple times during the past seven years, Greeks have struggled to scale an "economic prosperity hill" while managing a large debt overhang. Assistance from organizations like the IMF have (arguably) sought to help push Greece along, but the effort only seems to bring Greece closer to an unstable summit.

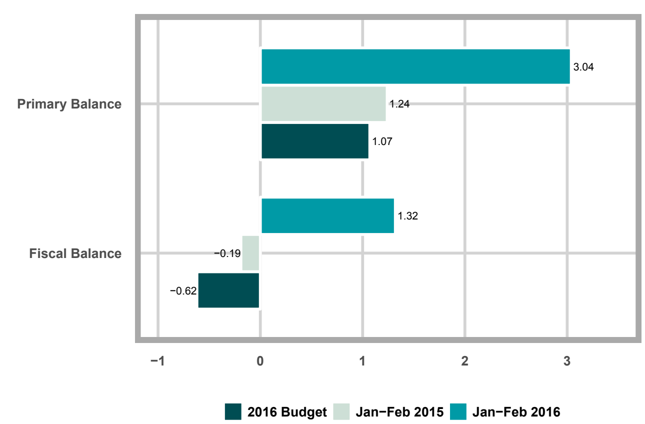
Greece once again finds itself approaching a hilltop. The Greek government boasted a primary budget surplus in January nearly 184 percent higher than the target it set in consultation with its creditors. Overall revenues exceeded target by 11 percent, and overall expenditures remained 15 percent below target. However, the rock could easily slide down the hill again. The Greek government requires more support from the so-called Troika (EC, ECB, and IMF) to pay back an ECB loan maturing in July in order to avoid bankruptcy,[1] and the IMF argues that Greece remains a "good distance away from having a coherent program" that the IMF would approve for further funding.[2] Likely as a result of this uncertainty, Greek CDS spreads have approached a level (2000 bps) on par with last summer's crisis. Asset allocators not directly exposed to Greece might still want to pay attention, as sovereign debt from the usual list of culprits (e.g., Italy, Spain, and France) continues to have relatively high correlations (>30 percent) to Greek CDS.

GREECE ENJOYS A LARGER PRIMARY SURPLUS THAN TARGETED BUT FALLS SHORT IN CRITICAL AREAS

A recent budget report from the Greek government features good news, at least at first glance. According to senior government officials, Greece achieved a primary surplus of 0.2 percent in 2015, besting its 2015-forecast of a 0.25 percent primary deficit.[3] The primary surplus estimates for January 2016 also appeared strong. During the month, Greece generated a €3.04bn primary surplus, a value that exceeded Greece's target (€1.07bn). Figure 1 offers more details.

FIGURE 1

The State Budget January-February 2016 (€bn).



Source: State Budget Execution Monthly Bulletin – February 2016.

A deeper dive into the report muddies the picture. The IMF believes that greater Greek arrears to its suppliers explain a meaningful fraction of its budgetary outperformance in 2015.[4] The 2016 report also appears less sanguine. While Greek government revenues

1 In August 2015, the Greek government signed the third agreement with the Troika (the ECB, The European Commission, and the IMF) to gain financial assistance for the period 2015-2018. A part of that rescue package that allowed Greece to cover short-term financial needs and recapitalize banks is due to the ECB this coming July.

2 Press release of a letter IMF Managing Director Christine Lagarde sent to Greek Prime Minister Alexis Tsipras (http://www.imf.org/external/np/sec/pr/2016/pr16149.htm).

3 Although Eurostat has not yet confirmed the Greek government's numbers, in March 2016 the Alternate Finance Minister Giorgios Houliarakis told the Greek parliament that the primary budget for 2015 was expected to close with a surplus of 0.2 percent of GDP. Source: http://www.ekathimerini.com/206598/article/ekathimerini/business/houliarakis-claims-primary-budget-surplus.

4 In January, arrears to private sector increased by 42.8 percent relative to December 2015. Moreover, no payment was made during the first two months, thus, failing to meet the budgeted amount of €5.5bn.

FIGURE 2

Revenues January-February 2016. Top panel reports total revenues in €bn. Bottom panel reports percentage changes from targeted values.

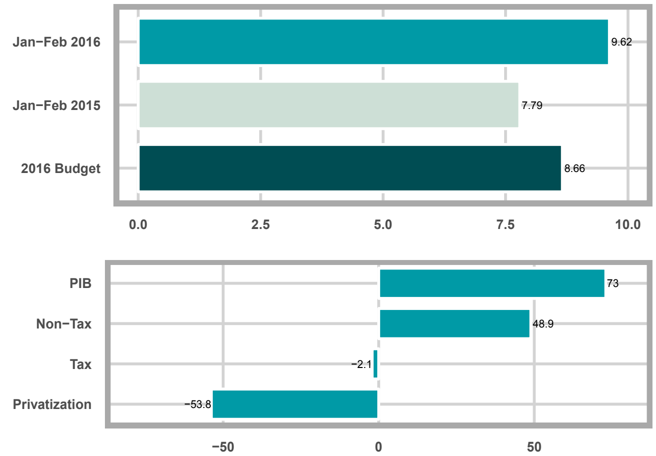
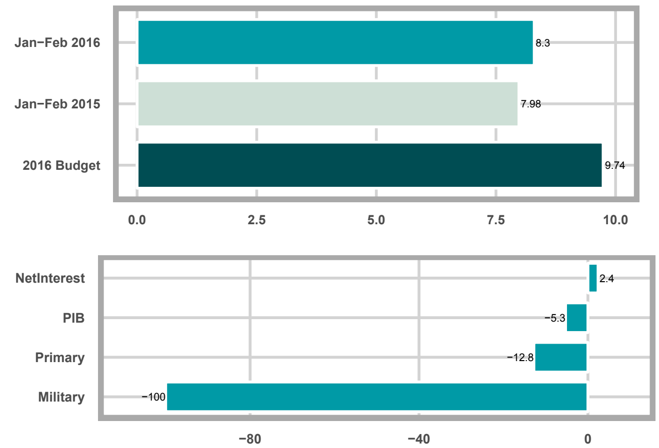


FIGURE 3

Expenditures January-February 2016. Top panel reports total expenses in €bn. Bottom panel reports percentage changes from targeted values.



Source: State Budget Execution Monthly Bulletin – February 2016, Ministry of Finance – General Accounting Office, Hellenic Republic.

exceeded targets, more than 100 percent of the surplus stemmed from "public investments budget revenue" (PIB), which includes aid from EU agencies for infrastructure investments.[5] In contrast, revenue from total tax (direct plus indirect taxes) and privatization fell short of targets (Figure 2). The August 2015 "memorandum of understanding" between the European Commission and Greek government listed both the tax revenue and privatization as important indicators of fiscal policy reform, so Greece's shortfalls in these areas might present obstacles to further relief.[6]

The issues on the expenditure side of the budget ledger appear different. Overall Greek spending fell below targets in January 2016, particularly for military outlays. However, the Troika will likely make expenditures a primary point for discussion, as the Greek government has yet to fully implement pension reforms. In fact, as reported by the IMF, Greece's pension deficit (pension expenditures minus social security contributions) amount to 10 percent of GDP, compared to a European average of 2.5 percent.[7]

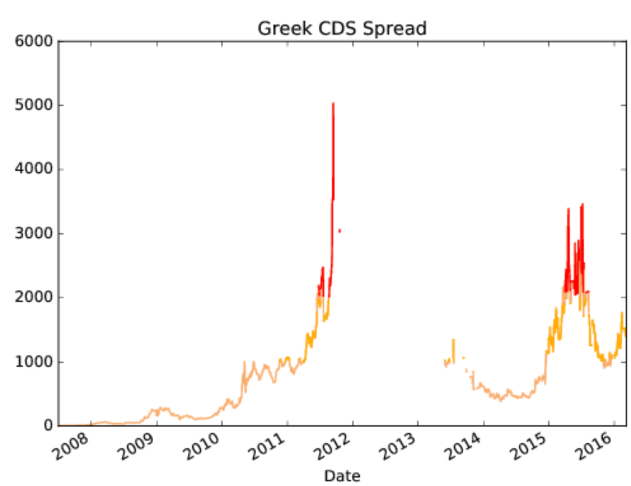
In sum, the recent budget developments may prove insufficient for the creditors to believe Greece can meet its 2018 target of a 3.5 percent of GDP primary surplus.

GREEK SOVEREIGN CREDIT RISK IS APPROACHING LEVELS SEEN DURING LAST SUMMER'S CRISIS

Financial markets recognize the increasingly precarious state of Greek sovereign debt (Figure 4). Credit default swap spreads have trended 350 bps higher since the beginning of 2016. The current level, nearly 2000 bps, resembles the implied risk that characterized the pre-bailout debate last summer.

FIGURE 4

The Greek credit default swap spread



Source: Bloomberg

5 The Public Investment Budget (PIB) refers to investment projects such as civil constructions (roads, building, ports) and is mainly composed of "EU flows" and "own resources."

6 See EC report: http://ec.europa.eu/economy_finance/assistance_eu_ms/greek_loan_facility/pdf/01_mou_20150811_en.pdf

7 IMF article: https://blog-imfdirect.imf.org/2016/02/11/greece-toward-a-workable-program/

While the market prices reflect lower sovereign risk to other European countries, the risk of contagion remains non-trivial. Figure 5 reports the top ten correlations of changes in CDS spreads globally using daily data for the past year. Similar to previous episodes, contagion presents the largest risks to Italy and Spain, with a correlation coefficient of 37 and 36 percent, respectively. French CDS swaps have a 24 percent correlation. These countries share similar economic fundamentals: nearly no growth, double digit unemployment rates, and high levels of public debt relative to the size of the economy.[8]

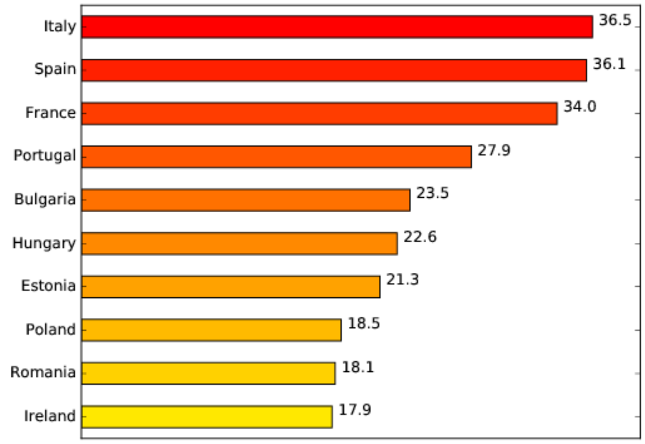
IMPLICATIONS

Most of the references to Sisyphus in analyses of Greece's episodic crises focus on the well-known punishment of endless futility in pushing a rock up a hill. However, another element of Sisyphus' myth seems at least as apropos. When Sisyphus enchained Death, the people did not rejoice. The sick and old continued to suffer on Earth with no hope for relief. Sisyphus' disruption of the biological natural order made life more miserable, not better, for most.

Trying to disrupt economic natural order seems analogous. Greek debt exceeds 180 percent of GDP, yet the government offers relatively generous pensions, its economic growth remains low, and both domestic and international politics make long-term solutions nearly intractable. Previous efforts by both Greece and the Troika may have enchained "economic death" (or at least a more depressing economic reckoning), but this seems a temporary outcome at best. It is probable that sooner or later, the natural order will reassert itself, and Greece will find a relatively stable equilibrium. One can only wonder how severely the transition to that equilibrium will affect the rest of the global economy and hope for the best for Greece.

FIGURE 5

Countries' correlation with Greece CDS spread (%)



Source: Bloomberg

8 Countries' statistics are reported in the following order: Greece, Italy, Portugal, Spain, and France. As of 2016, Debt-to-GDP: 179%, 132%, 129%, 101%, and 95.7%; Unemployment: 23.9%, 11.7%, 12.2%, 20.9, and 10.3%; Growth rate: 0.1%, 0.1%, 0.2%, 0.8, and 0.3%. Source: Eurostat.

INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma views itself as a technology company that applies a rigorous, scientific method-based approach to investment management. Our technology is inspired by a diverse set of fields including artificial intelligence and distributed computing. Occasionally, we read articles in the popular press that describe applications of technology that we find interesting, thought-provoking, and relevant for people thinking about improving the investment management process. Below is a subset of the articles we read this month. Please do not view the inclusion of these articles as an endorsement by Two Sigma of their viewpoints or the companies discussed therein. Two Sigma welcomes discussions (and contributions) about these and other such technology-related articles.

"Human Mind Excels at Quantum Physics Computer Game" by Elizabeth Gibney, *Nature*, April 13, 2016 (http://www.nature.com/news/human-mind-excels-at-quantum-physics-computer-game-1.19725/)

Quantum physicists have tapped the world's gamers to crowdsource the solution to a quantum problem their computer algorithms have proved unable to solve. Translating the problem of computing how fast a laser can travel between atoms without altering the atoms' energy draws upon Heisenberg's uncertainty principle, where speed and energy cannot jointly be identified. The 300 gamers attempting to solve the problem through 12,000 game trials produced solutions to the problem that computer algorithms later refined. The process proved more efficient than by using algos alone. The implications for the quantum physics world are many: average people can develop an intuition for quantum processes, scientists can successfully crowdsource quantum physics problems, and all those hours spent in front of a game console need not be in vain.

"Robots that Teach Each Other" by Amanda Schaffer, *MIT Technology Review*, April 7, 2016 (https://www.technologyreview.com/s/600768/10-breakthrough-technologies-2016-robots-that-teach-each-other/)

The "Million Object Challenge" attempts to accelerate a robot's learning curve by creating a repository to store robot lessons learned. A key challenge in teaching machines common tasks, like picking up and handling a small object, requires a vast amount of experience to master the skills. Humans learn these skills through hours of training in childhood, but that time investment proves expensive for robot development. Stefanie Tellex at Brown University fostered the "Million Object Challenge" program to encourage researchers to share their robots' trials with each other, since the knowledge is transferable across machines. A robot's progress in one laboratory informs different robots in other laboratories, helping participating labs around the world make faster progress than would otherwise seem possible. Tellex seems to have relied on another lesson from childhood – sharing.

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