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Research Summaries

Sailing With No Wind: The Impact of Deflation and Lowflation on Fiscal Aggregates

Nicolas End, Sampawende J.-A. Tapsoba, Gilbert Terrier, and Renaud Duplay



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Oil Exporters at the Crossroads: It Is High Time to Diversify

Reda Cherif and Fuad Hasanov



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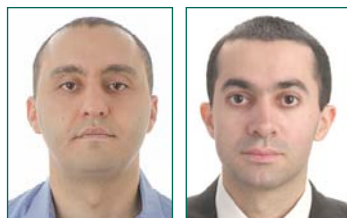


Entrenched low inflation (“lowflation”) or negative inflation (deflation) has become a source of concern in several advanced economies. This is particularly true for fiscal policymakers. With lowflation (say positive inflation below 2 percent) or deflation, downward rigidities in both tax brackets and expenditures make fiscal policy more challenging. Deflation is rare in modern history. This article uses both simulations and a dataset panel covering 150 years and 18 advanced economies to uncover its impact on public finances. The evidence is in line with the intuition of deflation having a negative impact on debt ratios; the impact on primary balances is, however, more difficult to assess. While the historical record

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Sailing With No Wind: The Impact of Deflation and Lowflation on Fiscal Aggregates

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suggests that, as ratios to GDP, primary balances are broadly immune from lowflation or deflation; this may be due to the quality of data during part of the period under review. In addition, fiscal policy has profoundly changed since the Second World War, and is now called to play a more active role than in the past. In the current economic environment, slipping into deflation could propel already-elevated debt ratios into an unsafe zone.

In recent months, inflation has been declining and running below target in a number of advanced economies. This

“Even with adequate indexation mechanisms, any unexpected deflation can translate into lower revenue collections.”

has raised concerns over the risks of protracted lowflation, or even deflation. In theory, lowflation or deflation can lead to declines in nominal GDP and unfavorable interest rate-growth differentials, resulting in increases in debt-to-GDP ratios. These effects can be compounded by downward rigidities in public spending and tax collection.

At the same time, over the past two centuries, with the exception of the Great Depression, deflation was generally not associated with persistent and deep economic malaise (Atkeson and Kehoe 2004; and Borio and Filardo 2004, 2005). The literature has even distinguished three broad categories of deflation: “The good, the bad, and the ugly.” Good deflations arise from positive supply shocks; bad deflations are associated with recessions and nominal rigidities; and ugly deflations represent periods of steeply declining prices associated with severe recessions such as the Great Depression of the early 1930s. Therefore, understanding the consequences of lowflation and deflation is key for today’s policymakers. To that effect, our paper investigates both the theoretical and empirical relationships.

Intuitively, revenue is expected to remain broadly unaffected by deflation. Because tax nets and GDP are strongly correlated, both the denominator and the numerator are

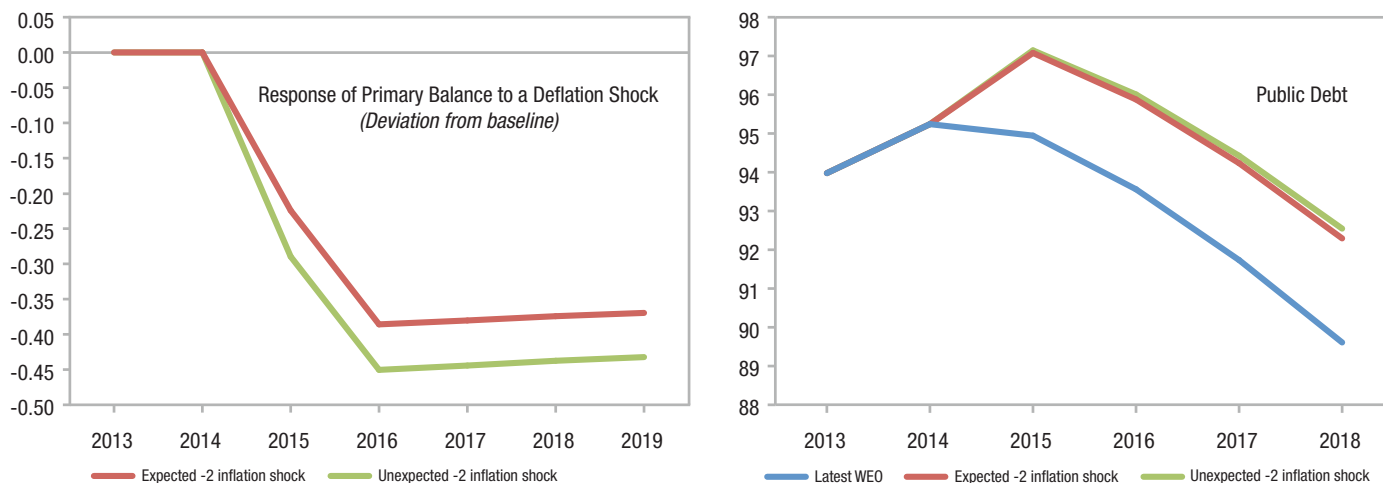
similarly affected by price developments. However, this may not be the case if tax brackets are not properly indexed. In the presence of nominal rigidities, lowflation or deflation may move some groups of taxpayers to lower brackets so that the price elasticity of revenue could deviate from one. Moreover, because of political reasons, governments may be reluctant to revise tax provisions downwards—including brackets and ceilings and floors of exemptions—in order to maintain the tax effort in real terms. Even with adequate indexation mechanisms, any unexpected deflation can translate into lower revenue collections.

In a similar vein, expenditure items may not adjust to deflationary shocks. In modern policymaking, downward rigidities may be the rule. In particular, the political cost of curbing wage bills or transfers in nominal terms may be very high. Accordingly, during deflationary times, these items may be frozen in nominal terms, leading to increases in expenditure-to-GDP ratios. Also, contractual arrangements (e.g., multiyear investment projects and interest payments) may delay the translation of deflation to expenditure reductions for current and capital spending. Finally, fiscal mechanisms may delay the reaction to a deflation shock, because budgets are prepared and executed in nominal terms, so that in-year adjustments might prove difficult to implement.

Furthermore, lowflation and deflation have the potential to raise debt ratios. For any given nominal interest and real growth rates, a low or negative rate of inflation raises the stock of debt over time if nominal rates do not adjust immediately. Put differently, with unchanged debt stock, lowflation or deflation is likely to increase the debt-to-GDP ratio. This is well known as the interest-rate-growth differential effect, which, when negative, pushes debt-to-GDP ratios upward.

We first build a simple deficit-debt simulation model, which incorporates indexation mechanisms and fiscal rules enforced or observed in modern economies. For the sake of illustration, the model is applied to the euro area using the September 2014 World Economic Outlook forecasts. Assumptions on the reaction of the different subparts of the primary balance to price shocks are formulated based on the information on fiscal frameworks and recent experience. We simulate a 2 percent decline in inflation in 2015, which is corrected in the following year. We find that such an unexpected temporary decline in inflation leads to a permanent deterioration of the primary balance-to-GDP by about 0.4 percent, mostly driven by an increase of expenditure (Figure 1). If the shock has been anticipated, the deterioration would be smaller, but still significant because of the presence of downward rigidities in the outlays by some governments. The debt-to-

Figure 1: Model Simulation, Impact of Deflationary Shocks on Fiscal Aggregates in the Euro Area (Percent of GDP)



Source: Authors' calculations.

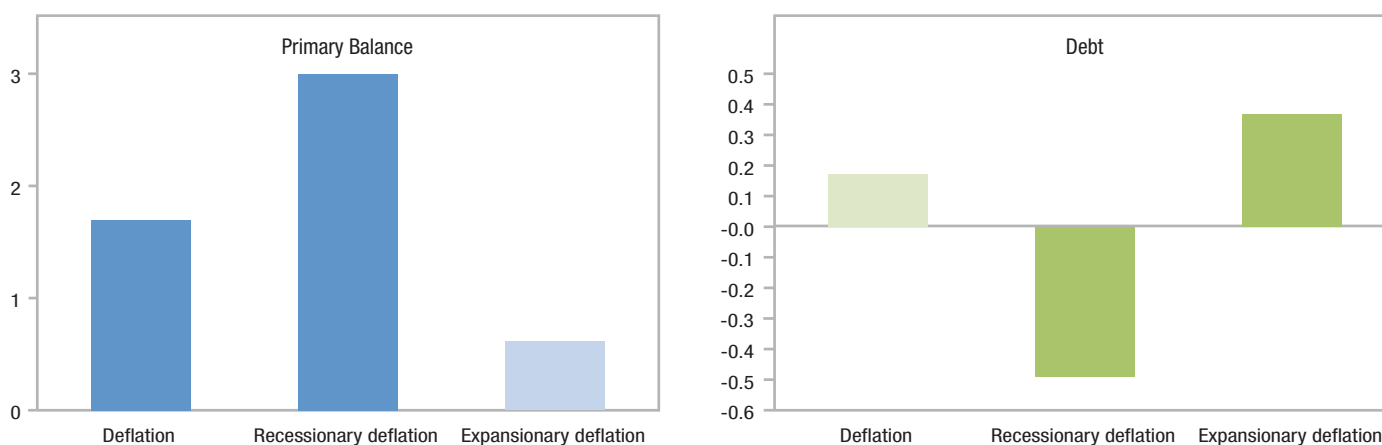
GDP ratio increases permanently by 2.5–2.7 percent compared to the baseline.

We also analyze the impact of deflation and lowflation through the prism of the historical record. Most of the documented episodes of deflation occurred in the second half of the nineteenth century and the first half of the twentieth century. A second set of episodes relates to the Great Depression (1929–34), when the combination of deflation and economic contraction triggered debt deflation. Since the Second World War, Japan has been a notable case, with this country struggling with prolonged deflation in the 1990s. Our paper

makes use of the historical record to investigate the empirical link between lowflation or deflation and fiscal policy. It uses an original dataset panel covering a long timeframe (over 150 years) and 18 advanced economies for inflation, growth, and fiscal aggregates—including the main components of primary balances, interest payments, and debt.

We find evidence from the historical record that debt-to-GDP ratios are more sensitive to deflation, but findings on the primary balance are mixed (see Figure 2). We confirm that deflation leads to increases in public debt-to-GDP ratios. Although the increase is somewhat lower, by almost 1.7 per-

Figure 2: Historical Record, Impact of Deflation on Fiscal Aggregates (Percent change)



Source: Authors' calculations.

Note: Light color stands for statistically-nonsignificant estimations at least at 10 percent.

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centage points, than in the deficit-debt simulation approach. During good deflation, as described above, debt-to-GDP ratios tend to be immune to the negative impact of deflation. Conversely, bad deflation has a greater impact on debt. Surprisingly, unlike the debt ratio, evidences are not clear cut with the primary balance. Some estimates indicate that the primary balance deteriorates during recessionary deflations and conversely improves during expansionary deflations. However, these findings are not robust to alternative specifications. Likewise, lowflation turned out to be uneventful for fiscal aggregates.

It is therefore difficult to generalize for the current situation for several reasons. First, as noted, the quality of the historical data may be problematic. The impact of lowflation or deflation regimes on fiscal aggregates may be diluted by the cumulative effect of policy measures, historical trends, or country idiosyncrasies. Also, the historical record for almost 150 years may not fully reflect past practices of reporting expenditure on a cash basis and hide arrears buildup to suppliers. Second, fiscal policy has profoundly changed since World War II. Fiscal policy regimes have evolved considerably and are now more directly linked to inflation than in the past. Tax systems have gradually adopted bases more aligned with key macroeconomic aggregates. Likewise, social transfers have been ramping up since their introduction in the 1930s and today's governments are more committed to maintaining a certain level of direct services—such

as schools or hospitals—than in the past. This has been evidenced during Japan's recent long combat against deflation. The deterioration of Japanese fiscal accounts was driven more by demographic pressures and anemic economic growth than by deflation. In the Japanese context, deflation has only played a role in thwarting policy responses.

Although politically challenging, when faced with deflation, fiscal authorities would have to consider adjusting tax brackets and lowering entitlements programs in order to preserve their primary balance objectives. Also, governments should be wary of possible adverse effects of expenditure rules designed to enforce discipline in times of inflation. Putting these findings together, lessons on the risks of deflation can be drawn for the current state of the global economy. Slipping into deflation could undo ongoing consolidation efforts and threaten fiscal sustainability. With debt ratios already elevated, a deflationary spiral could propel debt ratios into an unsustainable zone.

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Oil Exporters at the Crossroads: It Is High Time to Diversify

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international markets, technological upgrading, and climbing the "quality ladder" is crucial.¹

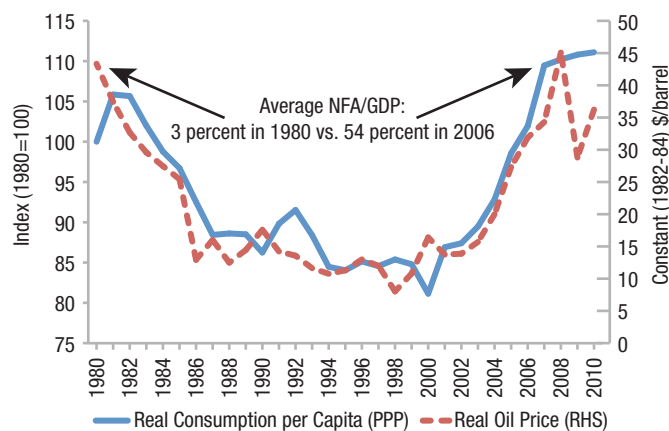
The 25 percent drop in oil prices in October 2014 revived the specter of the 1980s when prices fell and stayed depressed for more than 20 years. It is difficult to predict how persistent this decline will be, but it is a clear reminder

of the fundamental volatility of oil prices. More importantly, with a gathering momentum in investment in renewable energy, fuel efficiency, and electric cars, a secular decline in oil prices cannot be ruled out. In Germany, for example, the share of renewable sources in electricity consumption rose from 6.3 percent in 2000 to 25 percent in 2013. Tesla's electric cars recorded the largest sales in the luxury category in California in 2013.

The experience of the 1980s to 1990s highlights the substantial cost for oil exporters of a persistent decline in oil prices. Oil exporters went through what can be described as the "Greatest Depression" lasting about 30 years. Real consumption per capita on average fell by about 20 percent from the 1980 level and recovered to this level only in late 2000s as oil prices increased substantially (Figure 1).

1. See the high-level conference, "Economic Development, Diversification, and the Role of the State," at <http://www.imf.org/external/np/seminars/eng/2014/mcd/>, organized by the IMF and Kuwait's Ministry of Finance in Kuwait City, April 30–May 1, 2014. See also Cherif and Hasanov (2014) and Callen and others, forthcoming.

Figure 1. Real Consumption per Capita and Real Oil Price, 1980–2010



Source: Penn World Tables 7.1; IMF, *World Economic Outlook*
 Note: Oil exporters sample

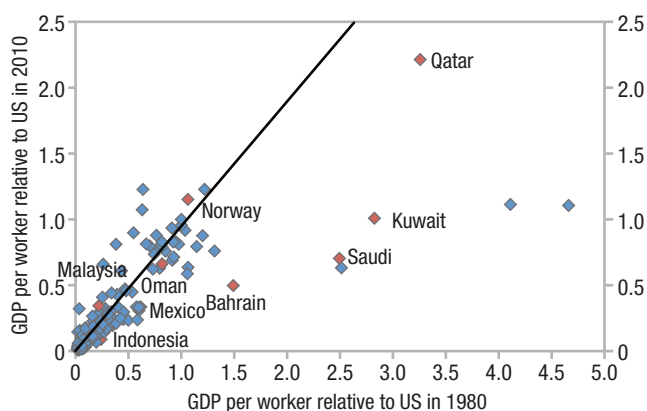
Dealing with low oil prices in the current context of increased government spending and rising expectations of the provision of jobs and income transfers is even more challenging. Having learned from past experience, many oil exporters have accumulated large sovereign wealth funds (SWFs), which is optimal in the face of high oil income volatility and low productivity of the tradables sector (Cherif and Hasanov 2012, 2013). Yet, SWFs would only provide a temporary cushion. Even in the optimistic scenario in which oil prices stay at relatively high levels, the prevailing growth model could lead oil exporters to a decline in real income per capita relative to the United States, as observed in the past (Figure 2).

The poor relative performance of most oil exporters can be attributed to low productivity gains and in turn to the absence of a dynamic tradables sector (Cherif and Hasanov 2014). To create sustainable growth, a country needs to constantly produce new goods and adopt and develop new technologies (Lucas 1993). Introducing new goods and tasks would allow managers and workers to continually learn and move up the “quality ladder” (Aghion and Howitt 1992). To achieve this on a large scale, Lucas (1993) argues that a country must be a large exporter. Empirically, high export sophistication is the major ingredient of sustainable growth (Hausmann, Hwang, and Rodrik 2007).

The standard indicators to assess economic diversification and vulnerability to oil price shocks—the non-oil share in GDP and non-oil real growth rates—are misleading (Cherif and Hasanov 2014). Most oil exporters largely rely on oil and gas exports to cover the consumption of tradable goods while the domestic economy is mostly concentrated in the non-tradable sector. No matter how large or sophisticated the non-tradables produced are, they would not help acquire the hard currency needed to cover basic foods, medicine, and the maintenance cost of public infrastructure. Export diversification is the key metric.

To achieve export diversification, the standard policy advice—implementing structural reforms such as improving institutions and business environment, building infrastructure, and reducing regulations—while necessary, will not be sufficient because of market failures. Market failures could stem from learning externalities or coordination failures (Rodrik 2005). Learning externalities arise when firms do not internalize productivity gains in, for instance, manufacturing compared to traditional activities such as non-tradable services or agriculture, leading to lower output in high productivity sectors and lower relative incomes over time. The coordination failures necessitate a critical market size to justify investment in complex technologies (e.g., automotive and aircraft). If a large number of firms invest together, the economy reaches a higher level of productivity and development.

Figure 2. GDP per Worker Relative to the US (PPP 2005 Constant \$), 1980 vs. 2010



Source: Penn World Tables 7.1

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Despite minimal government failures, Norway could not escape market failures exacerbated by Dutch disease—broadly defined as the crowding out of the non-oil tradable sector by oil exports income. The measure of export sophistication in Norway started declining in the late 1970s, in contrast to Denmark. In addition, manufacturing hourly wages in Norway (despite the strict rules to sterilize oil income) were the highest in the world in 2012, about double that of the United States or Japan, according to the U.S. Bureau of Labor Statistics. Unit labor costs in Norway increased by 50 percent in the 2000s, whereas unit labor costs declined in Germany and Sweden. Norway's annual average working hours per worker were the third fewest hours worked in the OECD in 2012.

To tackle market failures, the government needs to change the incentive structure of workers and firms. The prevailing growth model for many oil-exporting countries consists of exporting oil and gas, importing tradable goods, and producing non-tradables such as services and construction. The oil revenue distribution mechanism through transfers, public sector jobs, and contracts to firms in infrastructure projects skews the incentives toward the non-tradable sectors for firms and public employment for workers. The state needs to change this incentive structure to encourage individuals to develop skills and work in the private sector and provide incentives for firms to look beyond the confines of domestic markets and seek export opportunities.

Successful diversification strategies in Indonesia, Malaysia, and Mexico have relied on policies to create linkages in the existing industries and foster new industries with an emphasis on competing in international markets and technological upgrades to climb the “quality ladder.” As was done in Korea, the key element in providing state support is a strong governance and accountability framework in which the top management is responsible for the funds they receive. Cross-country experience shows that policies to develop tradable sectors and encourage firms to export include subsidies to support exporters and taxes on firms in the non-tradables, access to financing and business

support services through development banks and export promotion agencies, and the creation of special economic zones, industry clusters, research and development centers, and start-up incubators.

Taiwanese and Norwegian experiences provide interesting case studies in developing local firms and clusters. In 1980, a Taiwanese venture capital initiative provided financial incentives and tax credits to encourage firms to set up business in the newly created Science Park after failing to attract multinationals (Kuznetsov and Sabel 2011). Two funds were established and run by U.S.-educated Chinese. The venture proved successful and large banks, corporations, and even

“The prevailing growth model for many oil-exporting countries consists of exporting oil and gas, importing tradable goods, and producing non-tradables such as services and construction.”

conservative family conglomerates started creating their own venture capital funds in information technology businesses. In Norway, in the 1970s, the government intervened directly in the procurement of oil operators to develop an oil suppliers' cluster, required foreign operators to develop the competencies of local suppliers, and imposed a minimum of 50 percent of research and development spending to develop an oil field to take place in Norwegian entities (Heum 2008, Leskinen and others 2012). The government continued to support suppliers over the years to encourage firms to internationalize their activity. Eventually, the suppliers' cluster became successful, spanning a large array of high value-added industries.

In parallel, the state needs to provide incentives to workers to develop their skills and work in the private sector. The public sector should not be the employer of first resort, offering high compensation and benefits compared to most of the private sector. Firm limits need to be placed on public sector jobs and wages with training and support for work in the private sector provided to workforce entrants. As in

Belgium and Germany, vouchers could be used for training programs, apprenticeships, and vocational education. Skill development should also start at an early stage. The quality of early childhood education determines long-lasting outcomes and mainly works through positive effects on non-cognitive skills (Heckman and others 2013). Improving teacher quality, which is highly correlated with students' achievements, is paramount (Dolton and others 2011).

Fostering a spirit of self-reliance and creativity is another important element in the development strategy. Korea's "Saemaul Undong" provides an example of a social program that succeeded in changing the attitudes of citizens to support development (Kwon 2010). The main elements were first, to encourage communities to undertake small-scale projects to improve their surrounding environment, followed by investment in infrastructure. The government helped with funding and provided support in leadership, accountability, regional/national coordination, and technical assistance.

To achieve sustainable growth, countries have gone beyond the comparative advantage sectors and targeted high value-added industries such as manufacturing and innovation sectors with large spillovers and high productivity gains (Chang and Lin 2009). Simultaneously, the incentive structure of workers was tackled to develop needed skills. It takes decades to achieve high export sophistication, and it can no longer be postponed.

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Meeting the Nobel Giants

Mahvash Saeed Qureshi



Every three years, a group of young economists from around the world gets a unique opportunity in the picturesque town of Lindau to meet with some of the most esteemed names in their field, and to connect with each other. This year's gathering—the fifth Lindau Meeting in Economic

Sciences—saw about 450 young researchers, among them 20 IMF economists, and 18 Nobel Laureates, come together in August for an intensive exchange of ideas on a wide range of topics including inflation, inequality, repugnant markets, and the usefulness of economics. This article provides a brief account of some of the talks and discussions that occurred at the meeting.¹

As the shadow of the global financial crisis lingers, a recurrent theme in the discussions and presentations of the laureates in Lindau, Germany, this year was the challenges impeding a robust global economic recovery, and how these could be tackled. Often departing from conventional thinking, the Nobel Laureates—which included Robert Aumann, Peter Diamond, Lars Peter Hansen, Finn Kydland, Eric Maskin, Daniel McFadden, Robert C. Merton, James Mirrlees, Roger Myerson, Edmund Phelps, Edward Prescott, Alvin Roth, Reinhard Selten, William Sharpe, Christopher Sims, Vernon Smith, Joseph Stiglitz, and Mario Vargas Llosa (the 2010 Nobel Laureate in Literature)—did not shy away from throwing around provocative ideas. On the first day of the meetings, for instance, Sims argued that the monetarist view—that inflation is determined by money growth—is obsolete. In advanced economies today, nearly all deposits (including reserve deposits at the central banks) pay interest, implying that the distinction between “money” and interest bearing debt has disappeared, and the traditional money multiplier link has been broken. As a result, he contended, initiatives like quantitative easing, which many consider as an increase in reserves at the risk of creating rampant



Nobel Laureate Prof. Christopher Sims with IMF Staff in Lindau (from left to right): Aqib Aslam, Lucy Liu, Katsiaryana Svirydzhenka, Mahvash Qureshi, Amr Hosny, Tengteng Xu, Rene Tapsoba (back), Tigran Poghosyan, Kareem Ismail, and Volodymyr Tulin.

inflation, have been unable to spur inflation. So what could be done? Relying on the fiscal theory of price level, he maintained that the solution to the current macroeconomic conundrum requires an expansionary fiscal policy without a commitment to cut future expenditure or raise future taxes. For without such a commitment, people's expectation of a payback of the incurred debt through higher future primary surpluses, could restrict them from increasing spending, and debt could in fact become deflationary.

Complementing Sims' call for an expansionary fiscal policy, Diamond argued that the shift in the Beveridge curve (the relationship between unemployment and vacancy rates) in the United States since the global financial crisis suggests a deterioration in the matching/hiring process in the economy, which could partly be a structural issue, but there may be an aggregate demand element to it as well. There is thus an important role, in his opinion, for both monetary and fiscal policies to alleviate the problem and move the economy to the full employment rate that is being targeted.

In a trenchant presentation, Stiglitz discussed another reason for a drag on economic growth in major advanced economies: the high degree of income and wealth inequality. While recent data document large increases in both wealth and the wealth-to-income ratio, Stiglitz observed that there has neither been an associated decline in interest rates nor an increase in wages that might be expected if “wealth” is taken to be capital. He argued that much of the increase in the value of wealth is an increase in the value of land,

1. The IMF participants were Elif Arbatli (APD), Aqib Aslam (RES), Alberto Behar (MCD), Nan Geng (EUR), Francesco Grigoli (WHD), Fei Han (MCM), Burcu Hacibedel (FIN), Amr Hosny (MCD), Kareem Ismail (AFR), Phakawa Jeasakul (MCM), Fabian Lipinsky (WHD), Lucy Liu (SPR), Tigran Poghosyan (FAD), Mahvash S. Qureshi (RES), Katsiaryana Svirydzhenka (SPR), Rene Tapsoba (FAD), Volodymyr Tulin (APD), Anke Weber (FAD), Joyce Wong (WHD), and Tengteng Xu (EUR). The lectures and discussions from the event are available online at <http://www.mediatheque.lindau-nobel.org/>.

to which monetary policy and the process of credit creation have partly contributed. He asserted that since central banks exercise limited control on the quantity and, especially, allocation of credit; much of the credit has been directed by the financial sector to the purchase of existing assets—leading to asset price inflation and wealth creation for the financial sector, as well as for the owners of pre-existing assets. He proposed that central banks and regulators could circumscribe the flow of credit for purchase of existing assets, and direct it to productive investments instead. He expounded several other “centrifugal” forces contributing to inequality in the United States including education and tax policies, enforcement of antitrust laws, corporate governance and financial sector regulation. Referring to the IMF’s recent research on inequality,² which shows that lower levels of inequality are associated with faster and more stable growth, he argued that the notion of a tradeoff between redistribution and growth is now mute.

Following Stiglitz, Maskin addressed the question of why global markets have been unable to reduce inequality in developing economies. In his view, the theory of comparative advantage, which predicts that globalization should cause income inequality in emerging economies to fall, has broken down. Sketching an alternative theory, which conceives of globalization as an increase in international production, Maskin showed that when barriers to international production fall, moderately skilled workers in emerging economies get new employment opportunities, which bids up their wages toward international levels, while unskilled workers do not. It is this disparity that accounts for rising inequality in many developing countries.

How could economies be rebalanced? The tax and transfer system is a key instrument to affect income distribution. Mirrlees discussed extreme situations where marginal tax rates of 100 percent (or close) may be justified. Such cases rested on assumptions of a strong preference for work; high



Rapunzel Tower, Lindau Harbor

substitutability between consumption and work; and competition between skilled workers (such as sportsmen or inventors) for market share. He argued that such assumptions may not hold generally, but analyzing extreme results could improve our understanding of how incentives work, and help to design appropriate tax policies.

While other laureates debated challenges surrounding recovery from the global financial crisis, Smith worried that another housing market crash was already in the making in the United States. Arguing that the precrisis U.S. housing bubble was established by 2001, when housing prices relative to median income were

already above their long-run average, he showed that the U.S. housing market has regained much of the value lost in the recent crisis. Relying on evidence from market experiments, he associated large endowments of cash and inflows of mortgage credit money with housing bubbles—in turn, new housing expenditure tends to be a leading indicator of decline. He, however, considered monetary and fiscal expansions to be inert in repairing household and bank balance sheets in recessions, and instead called for bankruptcy and default as a reboot process.

Perhaps the most unconventional, but captivating, talk of the Meeting was delivered by Roth on “repugnant transactions”—transactions that some people want to undertake but others do not want them to. An example of such transactions is the sale of kidneys, which is illegal in most countries, although kidney donations are not. Recognizing that repugnance can act as a significant constraint on markets, Roth discussed devising a moneyless market exchange for kidneys—which gives people unable to find a suitable kidney from a friend or relative the chance to receive one from a potential donor in a reverse position. Although some repugnant transactions have changed over time (e.g., interest on loans), he indicated that others remain important phenomena, requiring more attention and research.

A much anticipated highlight of the Meeting was the opening speech by German Chancellor Angela Merkel. Attending the event for the first time, she questioned the

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2. See Jonathan D. Ostry, Andrew Berg, and Charalambos G. Tsangarides, “Redistribution, Inequality, and Growth,” IMF SDN/14/02 (<http://www.imf.org/external/pubs/ft/sdn/2014/sdn1402.pdf>).

Meeting the Nobel Giants

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laureates as to why the economics discipline had got so much wrong in recent years, with its assumptions and predictions proving to be far removed from reality. She wondered whether the underlying economic theories were wrong, or that policymakers listened to the wrong people. She encouraged economists to build bridges between theory and evidence, provide guidance to policymakers, and be honest enough to indicate areas where there is ambiguity and uncertainty. Emphasizing the constraints politicians face in decision making and implementation, she insisted that political advice would be useful if it is mindful of the realities of the day, which may be hard to compress into theoretical models.

Amid talks of failures, crisis, and risks to the global economy, the thought-provoking special lecture by Mario Vargas Llosa on the value of liberalism and freedom provided a much-needed glimmer of hope. Arguing that collectivism is a threat to civilization, Vargas Llosa emphasized how freedom and the willingness of humans to respect and live with those from different backgrounds has contributed more than any scientific discovery to end violence and make intellectual progress. He remained optimistic about the future and, citing Karl Popper, argued that while catastrophic things are happening around us, we have instruments as never before to defeat the “demons” of poverty, illness, and discrimination. This, he stressed, should give us enthusiasm

to face the challenges, and create a structural transformation that benefits all mankind.

The three days of intensive learning in the Bavarian town (also home to the Rapunzel tower; see photo!) were brought to a close with a boat trip to Mainau Island in Lake Constance, where the guest of honor, Queen Silvia of Sweden, addressed the participants, and where the three laureates—Diamond, Merton, and Roth—debated the overarching question of “How Useful Is Economics—How Is Economics Useful?” The laureates acknowledged that economists do not always have solutions to economic or social problems, but vehemently agreed that economics has had an extraordinary impact on the efficiency and development of national economies through, for instance, policy advice, financial market development, and market design. Looking forward, they suggested, that the development of new technologies, and accumulation of knowledge in other fields, offers infinite opportunities to adapt, and improve upon existing models and theories—which make the progress that has happened to date “just look like the beginning.”

At a time when the usefulness of the economics discipline is being questioned by those outside the profession, and economists themselves are doing much soul-searching, the talks at Lindau were a useful reminder of how rigorous analysis of various facets of economic behavior has come together to profoundly benefit society—while also inspiring young economists to stand on the shoulders of these Nobel giants and try to reach further.

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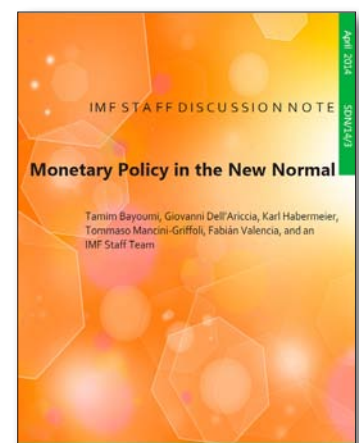
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Seven Questions on Financial Frictions and the Sources of Business Cycle

Marzie Taheri Sanjani



Financial frictions explicitly displayed in macroeconomic models can improve our understanding of the driving forces of the business cycle. Frictions, through the presence of information asymmetry, impose a non-zero counter-cyclical spread between lending and borrowing, which then amplify the role of financial shocks.

Question 1. What are the driving sources of the business cycle?

Following the seminal work of Kydland and Prescott (1982), the conventional view about the sources of the business cycle has been centered mainly on technology shocks (or total factor productivity (TFP)). After the experience of the recent financial crisis, the view regarding the driving forces of the business cycle turned toward investment channels. In line with this idea, Justiniano, Primiceri, and Tambalotti (2010) argue that a more promising theory is one that attributes fluctuations largely to investment shocks, and more specifically to marginal efficiency of investment (MEI) shocks. MEI shocks are exogenous disturbances that affect the efficiency of the process that transforms current investment goods to future productive capital. Furthermore, it is also argued that this shock is highly correlated with credit spread. To corroborate the relationship between investment shocks and the spread, we need a framework that explicitly allows for a financial intermediary sector and captures the interaction between marginal efficiency of investment and the spread. Taheri Sanjani (2014) extends the Gertler and Karadi (2011) model by incorporating investment shocks; a variance decomposition analysis shows that financial shocks are the main driving force behind the volatilities in post-war U.S. macroeconomic data. The financial shock in Gertler and Karadi (2011) are exogenous disturbances that affect the quality of capital stock, and are highly correlated with the credit spread. One policy implication can be that policy which affects the credit spread is the most effective instruments for recovery during financial crises.

Question 2. How do the economic models with and without financial frictions differ?

In a survey of financial frictions by Brunnermeier and others (2012), they explain a frictionless economy as an environment where funds are liquid and can flow to the most profitable project; this model can be presented with a single representative agent and the aggregate output is only the total capital and labor matter. In contrast, with financial frictions, liquidity considerations become important and the wealth distribution matters. This mechanism creates a *persistence and amplification* effect. External financing is more costly when compared with internal funds and the external financing depends on the return. Constraints on incentives, such as moral hazard, result in leveraging as productive agents issue, to a large extent, debt to ensure that the agent exerts sufficient effort. However, debt claims come with some severe drawbacks: an adverse shock wipes out a large fraction of the leveraged borrowers net worth, limiting his risk-bearing capacity in the future. Hence, a temporary adverse shock is very *persistent* since it can take a long time for productive agents to rebuild their net worth through retained earnings. An initial shock is amplified if productive agents are forced to fire-sell their capital. Since fire-sales depress the price of capital, the net worth of productive agents suffers even further (loss spiral). In addition, margins and haircuts might rise (while loan-to-value ratios might fall) forcing productive agents to lower their leverage ratio (margin spiral).

Question 3. What are the channels through which capital quality shocks affect the economy?

In an economy without financial frictions, a negative shock to the quality of capital stock disturbs the capital accumulation dynamic, which further deteriorates output moderately due to the “time-to-build” phenomenon. In the presence of financial frictions, negative capital quality shock affects the economy through an additional channel, namely, the bank

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balance sheet channel, by creating significant capital loss in the financial sector. Prior to the negative capital quality shock, financial intermediaries were highly leveraged and, when the shock hits the economy, intermediaries suffer severely from deterioration of their net asset position, which in turn induces a tightening of credit and a significant downturn in the economy. For example, suppose Blackberry mobile phone technology becomes obsolete as touch screen smart phone technology is introduced. There could be three channels through which this shock is transmitted. First, capital stock for producing Blackberry devices, de facto, depreciates much more rapidly than originally expected. Second, output of intermediate producers, say those who produce Blackberry parts or software, suffers. Third, the financial balance sheets of banks, which lend to firms such as Blackberry, suffer as stock valuations fall. One possible microeconomic interpretation is that a large number of goods are produced using good-specific capital. In each period, as a fraction of goods becomes obsolete, the capital used for producing those goods becomes worthless. In aggregate, a capital quality shock reflects the economic obsolescence of capital, which in turn leads to deterioration of the balance sheets of financial intermediaries.

Question 4. How is financial friction modeled?

The initial macroeconomics literature with financial frictions represented by Bernanke and Gertler (1989) and Carlstrom and Fuerst (1997) focused on the fact that a shock though temporary can have long-lasting persistent effects through feedback effects of tightened financial frictions. Costly state verification constraint introduced by Townsend (1979) is the key friction in the models. The main idea comes from the optimal contract between borrower and lender, which has to ensure that the borrower reveal its true state and does not take advantage of the information asymmetry but also has to be mindful of the surplus destroyed by costly verification. Moral hazard and costly state verification constraints introduce the notion of risk that does not come from lack of information but rather a selective provision of it. Knightian uncertainty is an independent and identically distributed process that cannot be foreseen, and upon its realization, it affects the state of agents. All together, these are the two mechanisms used to model financial accelerator mechanisms. Bloom (2009) studies the impact of uncertainty shock and Christiano, Motto, and Rostagno (2013) analyze the role of risk shock within a standard Dynamic Stochastic General Equilibrium (DSGE) setup.

Question 5. Why does data favor financial shocks over investment shocks in explaining the business cycle?

Due to information asymmetry the spread between borrowing and lending is non-zero; costly state verification puts in place a mechanism to monitor the risk in banks' activities. A deterioration of quality of productive capital adversely affects output and demand for productive capital, lowers a good producer firm's stock valuation and their collateral value, and ultimately financial intermediaries' asset valuation in their balance sheets drops. The impulse response function of a capital quality shock implies that the price of capital is procyclical. On the other hand, a marginal efficiency of investment shock implies that the value of net worth (or the stock market equity) is countercyclical, which is not plausible. This is the main reason why, in the presence of the financial accelerator block, the data favors the capital quality shock over the investment shock.

Question 6. How does a financial shock propagate into the economy?

A negative deviation financial shock can create a recession of plausible dynamism and magnitude with two remarkable features: firstly, output, investment, consumption, interest rate, and capital stock decline severely. Secondly, the recovery of the economy is slow, due to the prolonged deleveraging. Following the shock, asset prices fall severely. This acts as a shock to the intermediaries' balance sheets and their asset quality declines substantially. The spread soars as a consequence and increases the cost of funding. Since banks are highly leveraged, this produces an enhanced decline in the capital stock, which recovers very slowly. During the recovery period, the intermediary sector is deleveraging by building up equity relative to assets. Banking crises preceded by credit bubbles are typically followed by prolonged deleveraging. Data shows that the average deleveraging period is 5 to 6 years and typically starts 2 years after the onset of a financial crisis.

Question 7. Does the data support the model with financial frictions?

Bayesian econometricians use marginal data density to assess how well the model fits the data. This measure implies that the model with financial frictions fits the data well. The estimation sample period includes several periods of financial stress or crisis. Having a measure of financial stress, such as the spread between lending and borrowing, and the presence of financial shocks enables the model to capture the

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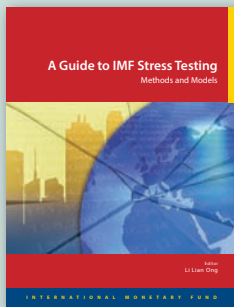
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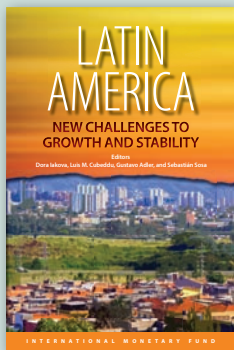


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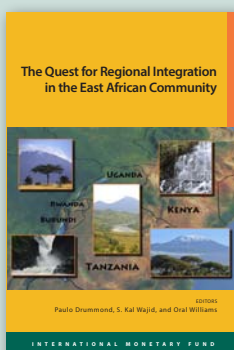


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impact of a financial crisis in a more direct and efficient way. As opposed to the model without financial frictions that captures these effects through the second round impact on real and nominal variables.

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