Volatility, Policy Uncertainty, External Finance, and Investment

Sumru Altug†

†Koç University, CEPR and KU-TUSIAD ERF

May 6, 2013

Investment and Growth

- Investment decisions occupy a central role among the determinants of growth.
- Fixed investment as a share of gross domestic product is the most robust explanatory variable of a country's growth (see, for example, Levine and Renelt,1992).
- DeLong and Summers (1991) provide evidence emphasizing the correlation of investment in equipment and machinery with growth.
- Investment is also the most variable component of GDP, and therefore an understanding of its determinants may shed light on the source of cyclical fluctuations.
- Policymakers are typically concerned about the ultimate impact of alternative policy measures on investment and its variability.

OECD Report on Institutional Investors and Long-term Investment

Why is long-term investment important?

- Patient capital allows investors to access illiquidity premia, lowers turnover, encourages less pro-cyclical investment strategies and therefore higher net investment rate of returns and greater financial stability.
- Engaged capital encourages active voting policies, leading to better corporate governance.
- Productive capital provides support for infrastructure development, green growth initiatives, SME finance etc., leading to sustainable growth.

The Determinants of Real Investment Decisions

Several theories of investment have emerged in the Economics literature to explain the determinants of investment, including

- the neoclassical model of investment;
- the cost-of-adjustment/q-theory model;
- the time-to-build model;
- the irreversibility model under uncertainty;
- the fixed cost (S, s) model of lumpy investment.

The Determinants of Real Investment Decisions

Such theories imply a role for

- demand uncertainty,
- cost uncertainty,
- tax policy,
- liquidity constraints and imperfect capital markets.

They also emphasize features of the firm's economic environment such as

- time-to-build,
- regime shifts,
- subjective uncertainty and learning.

The Cost of Capital

The Jorgensonian neoclassical investment model assigns a role to the "cost of capital" defined as

$$c_t^\tau \equiv (1-\gamma)p^k(r+\delta), \tag{1}$$

assuming the price of capital is constant. This variable allows us to incorporate the effects of

- changes in tax policy;
- technological or market-based changes that affect the price of capital;
- changes in fiscal and monetary policy as captured by real interest rates.

Hence, an increase in the real interest rate r, the depreciation rate δ, or the price of capital p^k, or a decrease in the tax allowance due to the ITC γ will lower the desired capital stock.

Costs-of-Adjustment and q-Theory

The costs of adjustment/q theory suggest an endogenous adjustment mechanism for investment based on the idea that it takes time to put new machinery into place, to integrate it into the production process and to train workers to use the new machinery.

Define the variable Tobin's q as

$$q_t = \frac{\text{Market value of the firm}}{\text{Replacement cost of capital}}. \tag{2}$$

Tobin's q-theory of investment states that firms will invest if q_t exceeds unity, and will disinvest if q_t falls below unity. The main insight of Tobin's model lies in its reliance on stock market data in order to capture firms' expectations with respect to future profitability.

Irreversible Investment

- Irreversibility refers to the fact that firms' capital stock may be highly firm-specific, or alternatively, it may be industry-specific but industry level uncertainty may affect all firms similarly. Hence, if firms wish to sell their excess capital in response to an adverse demand shock, they may not be able to find buyers willing to purchase it.
- Even for less firm- or industry-specific capital goods, there may exist a "lemons" problem of adverse selection in the market for used capital that may similarly prevent firms from disinvesting.
- They may have to let their capital stock depreciate or else sell it for its scrap value, incurring very high costs of disinvesting in both instances.

Cost of Capital with Irreversibility

Assuming an interior solution, the firm's capital accumulation decision is now governed by a modified cost of capital as $c_t + \Phi_t$, where c_t is the traditional Jorgensonian cost of capital and Φ_t is an endogenous risk premium (or endogenous cost of adjustment) due to irreversibility.

- If the irreversibility constraint is not expected to bind in the future, then $\Phi_t = 0$ and firm's investment decisions depend only on c_t.
- If the firm expects the irreversibility constraint to bind in the future, then the expected cost of investing in the future is greater than the expected benefit, and the endogenous risk premium is given by

$$\Phi_t = (1-\delta)E_t\left\{p_{t+1}^{kH} - \beta E_{t+1} V_K((1-\delta)K_{t+1}, h_{t+2}, p_{t+2}^{kH})\right\},$$

where $V_K((1-\delta)K_{t+1}, h_{t+2}, p_{t+2}^{kH})$ is the shadow value of future installed capital.

The Determinants of Investment under Irreversibility

- State of demand: For a monopolistically competitive firm, an increase in risk in the sense of an FSD shift in the distribution of demand raises the endogenous risk premium Φ_t and depresses irreversible investment.
- Productivity: An increase in the variability of productivity at the firm level will reduce the future expected benefit of investment V_K and hence, increase Φ_t, again lowering irreversible investment.
- Market structure
  - Caballero (1991) shows that the irreversibility constraint becomes irrelevant for a perfectly competitive firm but not if the firm is a monopolist or imperfectly competitive.
  - However, an increase in aggregate uncertainty even for a competitive industry with free entry and exit will reduce irreversible investment due to a feedback mechanism in prices, which fall less in the case of an adverse demand shock.

The Determinants of Investment under Irreversibility

- Price of new capital: Jones (1994) finds a strong negative relationship between growth and machinery price. Furthermore, there are substantial innovations in the development of new machinery and equipment which induce uncertainty in its price. Altug, Demers and Demers (1999) show that increases in risk in the distribution of the price of new capital will reduce irreversible investment under monopolistic competition.
- Tax policy: Altug, Demers, and Demers (2009) show that a temporary investment incentive such as a temporary ITC generally increases the variability of investment in the short and the long-run. The level of investment decreases in the short-run and increases in the long-run. Thus, a temporary ITC does not always lead to higher investment but always leads to more volatile investment.

The Determinants of Investment under Irreversibility: Multi-Stage Projects

Multi-stage projects: The firm now chooses at t how much it will invest in all stages of the project but it does not know the realized costs in all future periods nor the state of future demand J periods into future when the project is completed. Thus, with time to build the firm is exposed to greater uncertainty:

- First, the marginal costs which must be incurred over time are uncertain;
- second, the marginal benefits of investing occur J periods in the future when the state of demand is less certain.

These two factors will act so as to lower irreversible investment and increase the incidence of the binding constraint relatively to the basic model without time-to-build.

The Determinants of Investment under Irreversibility: Financing Constraints

Financing constraints: Altug, Demers, and Demers (2003) show that the firm's investment decision is characterized by two types of inaction zones: the first having to do with irreversibility and the second with financial constraints.

- For firms with high levels of retained earnings or net worth, actual investment behaviour is determined by the irreversibility constraint, uncertainty and the expectation of future financial constraints.
- For firms with lower levels of net worth, the cost of external finance varies inversely with the amount of net worth.

Summary

- This discussion shows that real investment decisions are affected by such factors as the price of capital, the state of demand, interest rates, tax policy, among others.
- Furthermore, most investment decisions tend to display varying degrees of irreversibility, and hence, are sensitive to risk and uncertainty.
- In the presence of financial constraints, firms may choose not to invest depending on the importance of the irreversibility constraint as well as the cost of external finance.
- Hence, understanding the nature of uncertainty facing firms, such as policy uncertainty, as well as access to external finance, especially longer term finance, is crucial in understanding investment behavior as well as growth and fluctuations in an economy

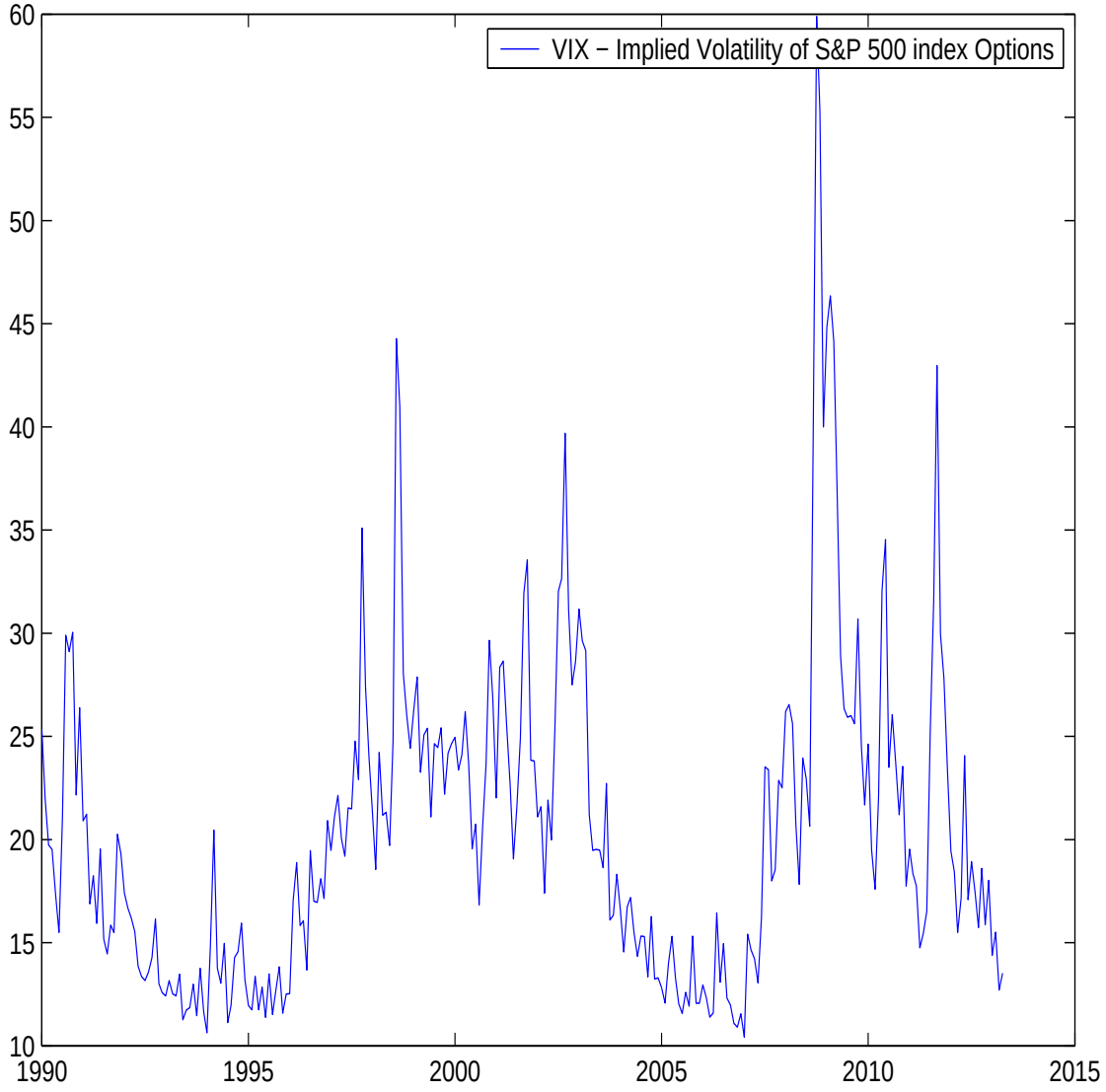
Access to Finance in EU and non-EU Countries

- The European Commissions Directorate General Enterprise and Industry and the European Central Bank (ECB) established the Survey on the Access to Finance of Small and Medium-sized Enterprises (SAFE) in 2009. The purpose of the survey is to assess the trends in financing conditions for SMEs and larger firms' financing conditions.
- Access to finance is the most pressing problem in Greece (mentioned by 30% of respondents), Slovenia and Estonia (mentioned by over a quarter of respondents in both countries). It is the second most important issue in Hungary, Romania, Spain, Portugal, Bulgaria, Lithuania and Ireland. Outside of the EU, access to finance is a major issue in Montenegro (36%), Israel (30%) and Turkey (28%).

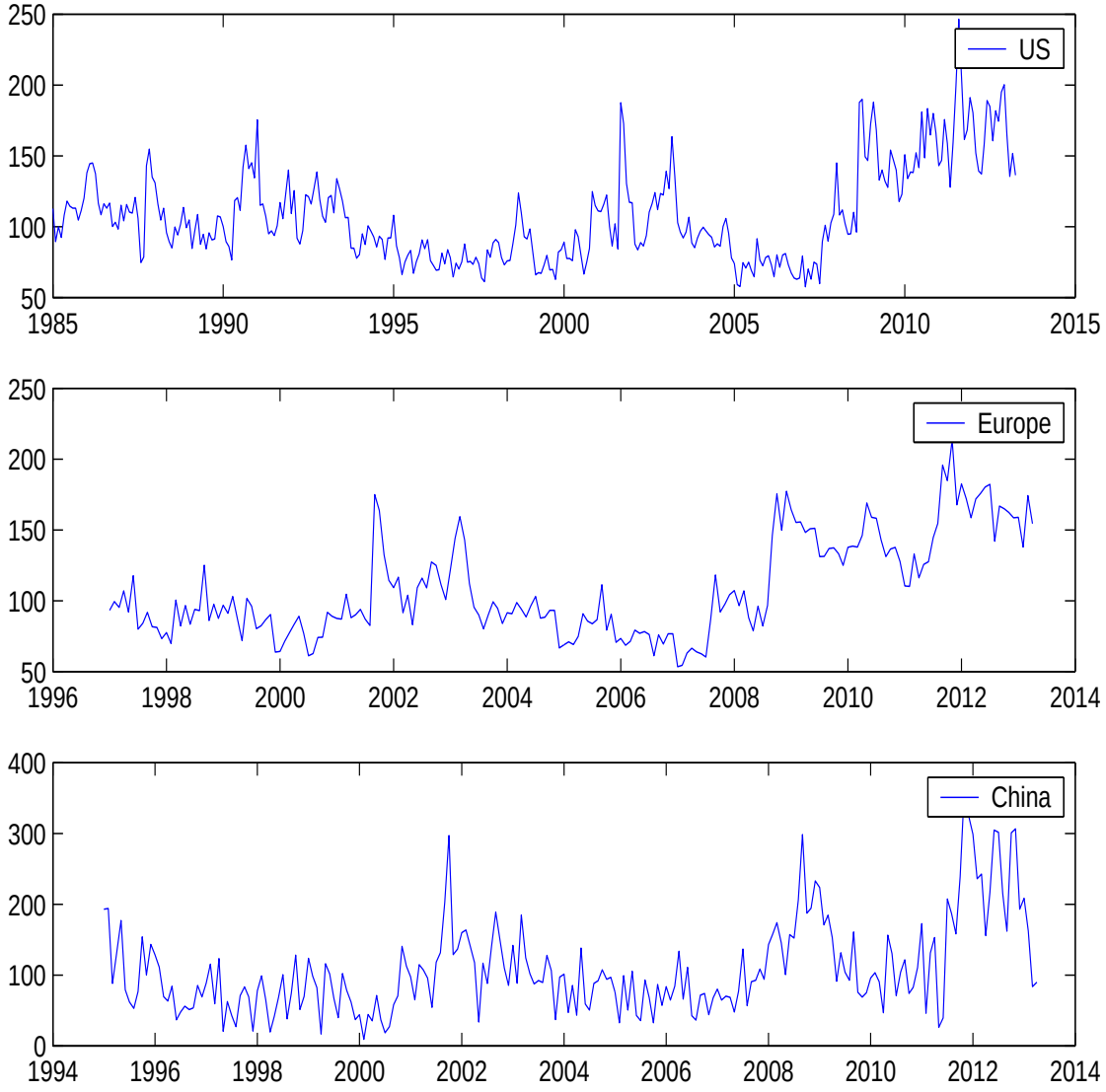
Innovation and Access To Finance

- Ayyagari, Demirg-Kunt, and Maksimovic (2006) examine the determinants of firm dynamism across 34 developing economies and over 10,000 firms.
- They find while the use of external finance is associated with greater innovation by all private firms, it makes state owned firms even less innovative.
- Financing from foreign banks is associated with higher levels of innovation compared to financing from domestic banks. While innovation increases with a greater share of firms borrowing in foreign currency, it decreases with the extent to which financing requires collateral.

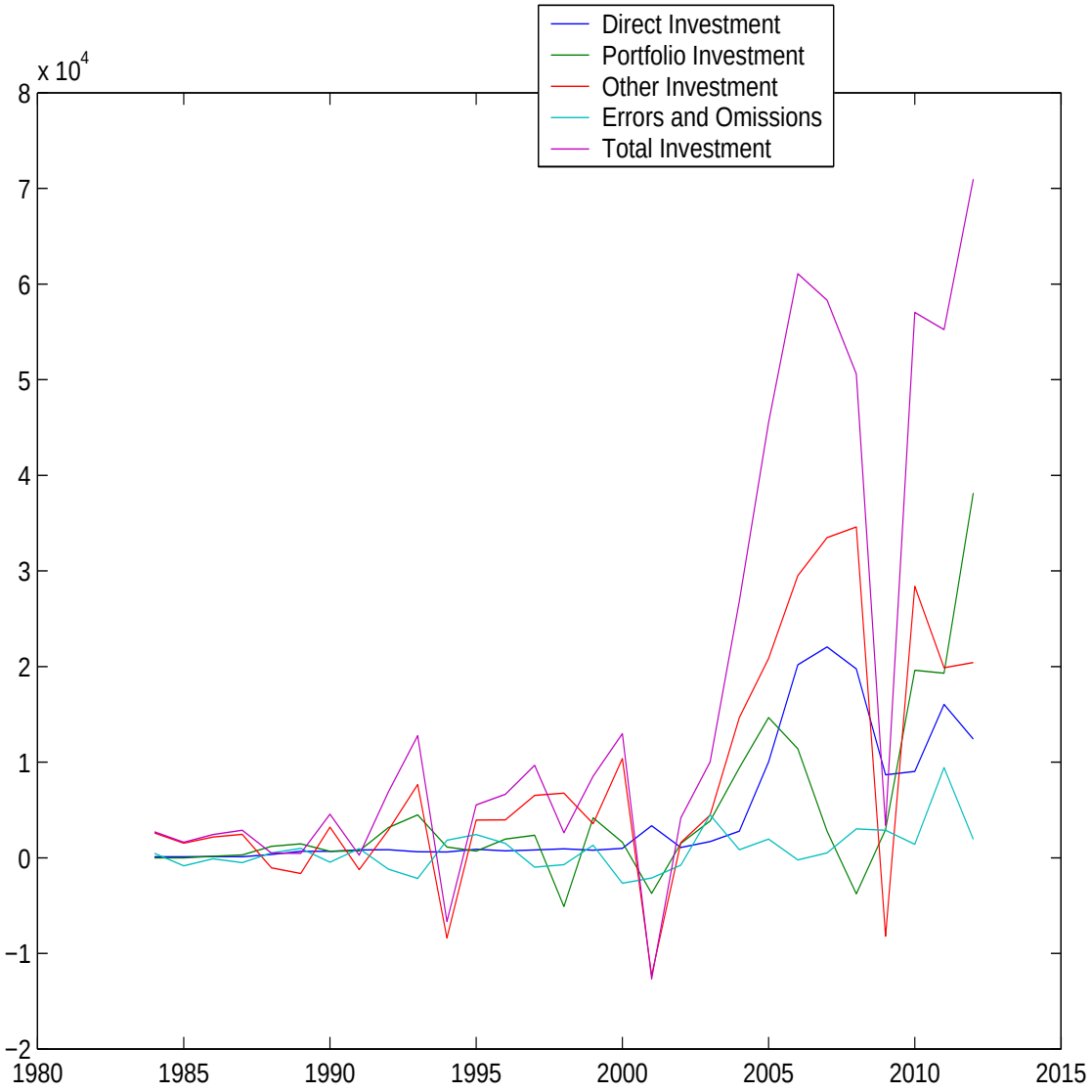
Volatility Index



Economic Policy Uncertainty Index



Capital Flows to Turkey



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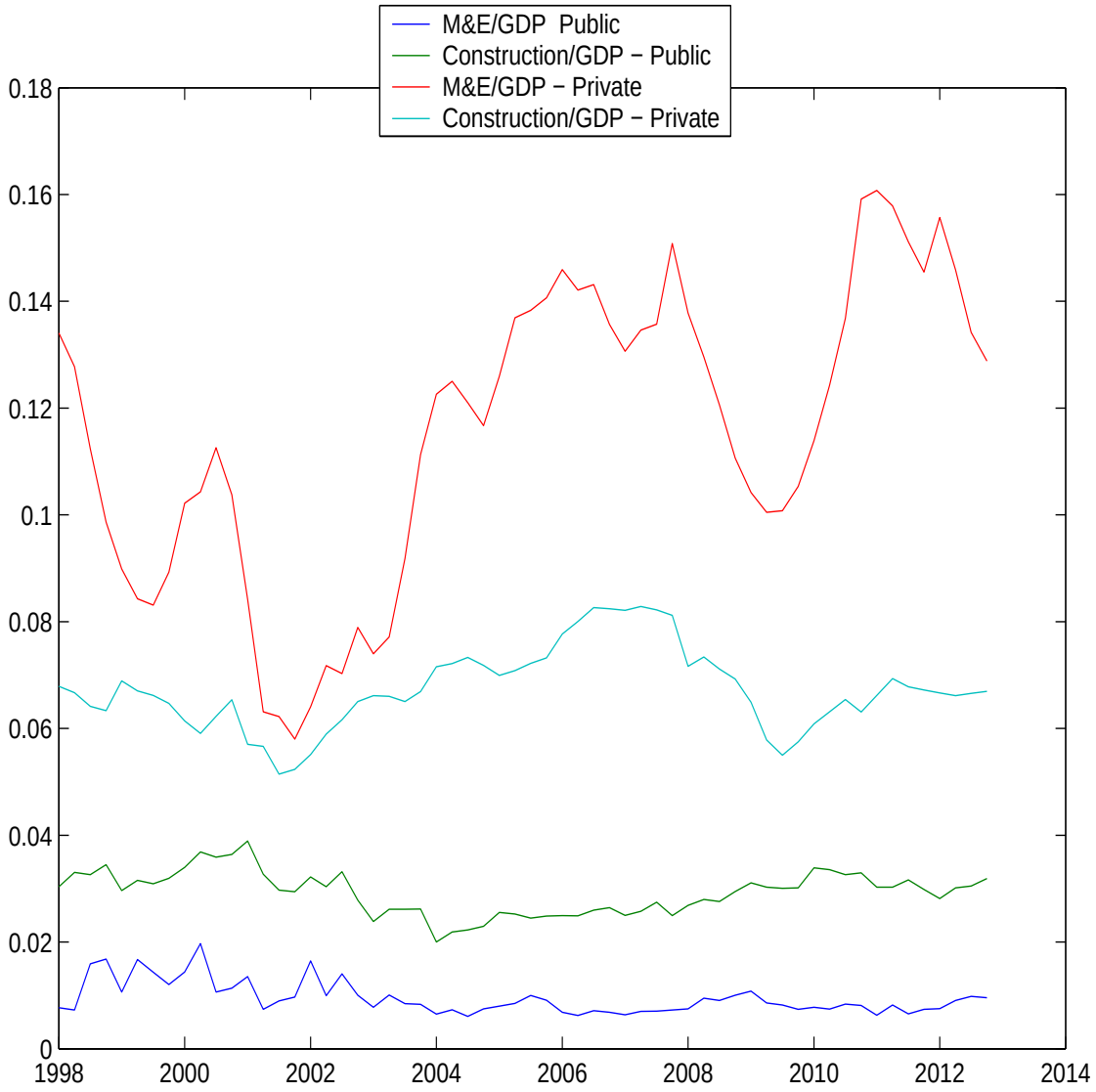

Volatility and Policy Uncertainty

- The volatility index is given by VIX - Implied Volatility of S&P 500 index Options.
- The source for the economic policy uncertainty index is Scott Baker, Nicholas Bloom and Steven J. Davis at www.PolicyUncertainty.com. We use the indices for the US, Europe, and China to capture policy uncertainty in the three main economic regions.
- As well known, the VIX increases during the 2008-2009 global financial crisis, with another spike during 2010-2011 corresponding to the intensification of the European sovereign debt crisis. The increase in the economic policy uncertainty index in the US may also reflect the uncertainty associated with the fiscal cliff, which was narrowly averted at the beginning of 2013.

The Impact on Capital Flows and Investment in Turkey

- In line with the dramatic increase in global risk and uncertainty, we observe a decline in capital inflows to Turkey during 2008-2009, both in direct investment as well as portfolio flows.
- Hence, we observe that investment flows to Turkey depend on overall perceptions of risk and uncertainty, including policy uncertainty.
- We also observe that the different components of real investment expenditures as a ratio of GDP start declining in 2008, reaching a trough in in late 2009, and start recovering by the beginning of 2010.

Conclusion

- Taken together with the results on the determinants of investment, these results suggest the importance of creating a stable environment for investment and improving the flow of long-term capital to an emerging economy such as Turkey.
- This will tend to increase to access to external finance for firms, and stimulate greater investment activities.
- Reducing volatility and policy uncertainty, whether this measured in terms of uncertainty regarding tax policy or monetary and fiscal policy that affect the level and volatility of real interest rates, also seems crucial.
- Finally, developing macroprudential measures that help to insulate the Turkish economy from external sources of risk and uncertainty also seems important.