Money, Derivates, Innovation and Growth

Fifth Colloquium

edited by
Paolo Savona
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Editors’ Preface

Foreword

For the 5th year in a row we met together in Foligno (at Nemetria Association) to honour the memories of Dr. Guido Carli and Prof. Alberto Predieri. This time we discussed the issues related to the growing links between money and derivatives and possible influences on innovation and growth.

Once again, the twofold meeting purpose was met:

• to exchange friendly and openly our points of view, through the discussion of original pieces of scientific research,

• to prepare a better explanation for the public opinion on the implication of financial developments and technological innovation on world growth.

The excellent group of scholars whom we invited this year prepared some papers, memos and comments which converged on the common view that there are possible links among the 4 variables that the profession is not yet ready to fully understand. The discussions that we had have been dominated by the impact on money and growth of the recent subprime credit crisis which adds new problems to the already quite complicated developments on global markets. The possibility to forecast these developments escape from any econometric research and lay largely on the intuition of students and policy makers, i.e. “metaeconomics” is bypassing economics!

A large part of the merit to achieve the goal of the meeting goes again to Iftekhar Hasan and Cristiano Zazzara who took care of the scientific organization and to Monica Degl’Innocenti who bore with the Nemetria staff the entire logistic burden in a very excellent way and made possible these proceedings of the Fifth Colloquium in a very short time.

Associazione Guido Carli
Fondazione Cesifin Alberto Predieri
Editors of the Journal of Financial Stability
Ladies and Gentlemen,

Your chosen subject — the role of financial innovation and specifically derivative markets, their relation with money and their impact on economic growth is a highly topical one, as witnessed by the recent financial market turbulence. From the central banker’s perspective it is crucial owing to its implications for the stability of the financial system and the conduct of monetary policy.

Derivative instruments have become an essential element of the most advanced financial systems. Their use has grown further in the last decade and their total notional value is now equal to ten times world GDP.

As hedging instruments, derivatives allow market participants to unbundle the various risks and price and allocate them among a multitude of investors. Derivatives are also used to leverage portfolio risks and to bet on future market movements. The transfer of risk through derivatives may be in the interest not only of the seller but also of the buyer. For instance, the latter may improve portfolio diversification at small cost or improve asset-liability matching. This reciprocal advantage is at the root of the success of derivative contracts.

The potential benefits are not limited to market participants but may also extend to households and firms at large. First of all there is an indirect effect that operates by enhancing the efficiency, scope and resiliency of financial markets. Specifically, derivatives broaden the range of investment strategies available to investors and, in normal times, make financial markets more liquid, thus helping to curb financial volatility. Many observers argue that they have raised the productivity of the financial system, just as new production technologies have boosted that of the real economy. Derivatives also have a direct impact on the real economy, notably by changing the risk management practices of firms.

Placed as they are at the crossroads of so many financial flows, however, derivatives and their use have crucial implications for financial stability. The turmoil now affecting global financial markets is a reminder that
the growing reliance on derivatives entails significant risks.

Some of these risks are well known. Concerns may arise if, for example, derivatives are used by investors – intermediaries, investment companies, firms, even individual investors – not mainly to hedge existing risks but to increase portfolio leverage or the volume of risks assumed. Moreover, credit derivatives can modify the modus operandi of the banks that use them. If lenders transfer part of the risk to others, the incentive to evaluate borrowers’ creditworthiness may be weakened. A clear lesson comes from the recent developments in the subprime mortgage market in the United States, where the transfer of risk is commonplace. Finally, like other financial instruments, if not properly used derivatives may become a source of instability. In this respect, intermediaries have to help customers to select the appropriate instruments, provide complete information and thoroughly explain the risks embedded in these complex products. An improper use of derivatives by customers may expose the intermediary to legal and reputational risks, undermine its profitability and jeopardize its stability.

The recent market turbulence has drawn attention to some other possible implications for financial stability. First, the transfer and dispersion of credit risk, which may reduce asset price volatility and risk premia in normal times, can have the opposite effect in times of stress: as we have seen in recent weeks, the market participants’ very uncertainty over which institutions ultimate sustain the losses, can lead to an indiscriminate widening of credit spreads for banks and financial institutions and, most worrying, to market illiquidity. One factor that played a major role in amplifying the recent financial turbulence is the fact that some of the structured products based on credit derivatives, in particular CDOs, became illiquid when it was most necessary to trade them. This sudden evaporation of liquidity was due in part to the exceptional complexity of these instruments and came despite the fact that CDOs are rated by major agencies, with some trenches being assigned a high investment grade.

Let me now turn to important changes that derivatives and the rise of new players have brought to the way monetary policy is conducted, communicated and transmitted to the economy.

Through the securitization of loans and their sale to institutional investors, banks can ease funding constraints for new lending and reduce
their capital requirements. A recent study by the Bank of Italy and the ECB using microdata on a large sample of euro-area banks over the last eight years shows how this affects the transmission mechanism. The banks that make more use of securitization are sheltered from the effects of monetary policy changes: in response to rises in official rates, their lending activity shrinks less than that of other institutions.

The interpretation of variables that represent a traditional reference for monetary policy becomes more complicated. This applies particularly to money and credit aggregates, as these are significantly affected by the new products and players. In the past, most of M3 in the euro area was held by households and firms, whose behaviour as money-holders we understood reasonably well. Today an increasing share is held by non-bank intermediaries, whose demand for money is likely to respond to different needs and is harder to interpret. Moreover, marketable instruments represent a growing component of M3; they are held for portfolio purposes and are less directly connected to transactions and spending on goods and services.

These developments require a new approach to monetary analysis, based on a larger set of data and attentive to the impact of financial innovation. Ongoing research at the Bank of Italy uses multivariate techniques to extract information from the common trend of a large set of monetary indicators (not only M3, but also its components, the monetary holdings of different sectors of the economy, and the counterparts of M3, including credit). The preliminary results indicate that this common trend conveys useful information on future inflation, confirming that the analysis of monetary indicators remains essential to an appropriate monetary policy, provided it is not restricted to a single variable.

Financial innovation also implies a greater role for expectations and monetary policy communication in the transmission of monetary policy and in the decision-making process of central banks. The wide range of information we can extract from financial markets enables us to estimate market expectations on inflation, growth and policy actions, the uncertainty surrounding those expectations, and even investors’ attitude towards risk. This is a crucial ingredient of the information set we use in our decision-making.

Owing to more complete and efficient financial markets, monetary policy is transmitted swiftly through asset prices. Not only actual but
expected changes in official interest rates very quickly affect a wide range of financial assets, in turn affecting consumption and investment decisions. In this context, policy communication becomes critical. On the one hand, if guided by proper communication, market reactions may partly “do the job” for central banks. On the other hand, errors in communication can be more costly than in the past, as they can easily increase volatility and, in extreme cases, induce a widespread portfolio shift, with potentially disorderly effects on liquidity and asset prices.

The importance of changes in market expectations and of proper communication by the central banks was confirmed this summer, when the crisis originating in the US subprime mortgage market produced a heightened preference for precautionary liquidity by banks and consequent strains in the interbank market. The Eurosystem monitored the developments and acted to ensure the orderly functioning of the money market, providing liquidity when needed. At the same time it made it clear that its monetary policy stance would continue to be based on the macroeconomic outlook and threats to price stability in the medium term.

The summer’s events have confirmed that many of the implication for both financial stability and monetary policy transmission of the changes in financial markets in recent years still need to be understood fully. This Colloquium is timely indeed, as in-depth reflections on these issues are urgent and important. As Eurosystem central bankers we pay a good deal of attention and research to the themes treated in this Conference. To judge by the programme and the highly qualified speakers, the debate will unquestionably provide valuable insights into these developments.

I wish you a very fruitful day of work.
Ginevra Cerrina Feroni  
University of Florence  
and Board Member of Fondazione Cesifin Alberto Predieri  

Ladies and Gentlemen,  

as board member of the Cesifin Alberto Predieri Foundation, I am extremely pleased, to replace today Professor Giuseppe Morbidelli, whose I had the honour of being the pupil, in the same way he has been pupil of the late Professor Alberto Predieri, from whom the Foundation takes its name.  

Mine is indeed only a welcome greeting, since I am a Professor of Constitutional Law and my knowledge about the Country of our kind guests and friends is limited to the Supreme Court, to checks and balances, to the presidential powers, to the themes of implied powers, and of commerce clause; yet I would say that the matter which is closer to the themes dealt with in our Convention is that which starts from Alexander Hamilton and is bound to the birth of the National Bank of America and to the creation of a single monetary system. Not only does he recognize the substantial power of the market to produce economic wealth, but also the necessity of aids and cautious encouragements on behalf of the government to promote and direct the market forces.  

Obviously from Hamilton onwards the bank activity has become extremely varied and refined. I am just thinking of the central role today played by the financial derivatives and of that complex amount of “financial engineering” progressively increasing and evolving whose function is still that of representing protection values, in order to reduce the aleatory price of a correlated value. These are all instruments allowing a wider liquidity in the capital markets, supporting the development of international commerce. Moreover they are a powerful means of economic growth.  

An issue - I could also omit it - that however raises legal, economical and political questions of great importance pertaining to the structure of intermediation; and in fact the interests that lie behind are unmeasurable and the crises of the derivatives are able to create crises of the Stock Exchange system, crisis of the economical system and recessions of whole countries.
Let’s think of the frequency with which banks and Financial Brokers are sued for damages having encouraged inexperienced customers to invest in highly speculative transactions on financial by-products such as Swaps, Futures, Options, Hedge Funds, Trading. This has brought a strong impact on the whole system and its credibility.

Naturally all these activities can be regulated and kept under check through doctrinal coordinates; however, the spectre of the self-assured use of these financial products, cyclically, crops up. If I wanted to make a comparison with the theory of the constituent power, I could say crises are always ready to burst out just like the constitutional power: “a fire that smoulders under the ashes can always re-emerge”, the theorists of the French revolution said.

It is up to us then to identify some more effective reporting and monitoring mechanisms, since the exponential growth of the derivatives over the last few years highly jeopardizes the control of the single national supervisory authorities on the field without any national borders.

The problem never solved is here: imposing restrictions to the markets or keeping promoting the self-regulation of the Bank system? It seems to me that up to now the policy of the American Central Bank has followed the latter pattern.

“Both central Banks and the supervisory Authorities should resist to the temptation to issue ad hoc rules for every kind of new financial instrument or institution” (so said two years ago the President of the Federal Reserve about suggestions of the strict regulation concerning derivatives and edge funds).

The answer has been that existing rules are sufficient.

This is quite a crucial issue. I must say that our Foundation has investigated the same subject, together with the Guido Carli Association. In fact, I recall the second International Conference on the theme of “The new architecture of the International money system” held in Florence in October 1999, planned and wanted, by the far-sightedness of Professor Savona and on this subject it’s important to focus again.

That’s the reason why, together with the Guido Carli Association, we have organized today’s Conference where a real “parterre de roi” attends in the persons of famous experts of the discipline from all over the world and the representatives of institutions.
The synergy, between the academic world, finance and institutions, has always been one of the targets of our conventions.

It is a great pleasure and an honour to open the workshops of this morning. I want to thank you for attending this meeting.

Best wishes for everyone.
Paolo Savona
Associazione Guido Carli
and University of Rome “Luiss Guido Carli”

The problem. Scholars and authorities alike are in favour of the free operation of the derivatives market, as in their opinion the properties of these instruments are such as to improve market efficiency and make risk management more rational.

They are convinced that derivatives have
1. stabilizing effects on the price volatility of the underlying monetary and financial assets;
2. price discovery properties that reduce uncertainty and so improve market participants’ choices;
3. abilities to lower asymmetric information, helping more rational choices on the part of market agents and monetary authorities;
4. power to curb bid-ask spreads and transaction costs;
5. power to reduce frictions and noise-component in exchanges and price-settings.

Following the grave crises provoked by their improper use during the last decade – from Barings (“UK Her majesty’s bank”) to the US subprime mortgage market – the authorities are now paying greater attention to the problem and are oriented towards more incisive regulatory intervention. However, regulation cannot do without an understanding of the role played by these financial innovations in the functional mechanisms of the economy and in economic policy choices.

The monetary authorities now acknowledge that derivatives have reduced the significance of the indicators that guide their policy choices and have altered the mechanism whereby their decisions are transmitted.

Fiscal policy makers appear to be less fully aware of the impact of derivatives on their own choices.

Associazione Guido Carli has been working on both aspects for over a decade and has gone further, analyzing the effects of derivatives on investment, and thereby on real economic growth, income distribution and price-setting.

Ignoring the existence of financial derivatives reduces the heuristic capacity of studies in economics.
Our view of the problem. The macroeconomic potential effects of derivatives is represented in the following logical scheme:

**Flows’ Chart of the Derivatives’ Macroeconomic Effects**

```
  price
   ↑
Sraffa’s effect
   ↓
  → L¹ (Y)
    ↓
Derivatives
  → rate
    ↓
  → L² (r)
    ↓
  → Defgov
    ↓
  → Debtgov
```

This is an elementary version of a more complex scheme, but it reflects our idea of what constitutes the “heart” of the question in macroeconomic terms. In a nutshell, derivatives affect interest rates in somewhat the same way as Keynes’s liquidity preference. Using the “Tobin’s q” paradigm, it follows that derivatives also affect the rate of capital formation, hence real economic growth and (using the “Sraffa paradigm”) prices in the oligopolistic markets. Another effect stems from the burgeoning use of derivatives in public debt management, with an increasing influence on current public spending.

Essentially, financial derivatives have so great an impact on market volumes and prices that the many empirical studies that fail to take them explicitly into account contribute little or nothing to our understanding of the functioning of economic mechanisms and produce fallacious predictions.

We do not concentrate on the use of derivatives as a way of hedging risk but as instruments for rational portfolio management by public and private operators and for low-cost speculation free from
regulatory constraints. We agree that risk hedging via derivatives offers substantial benefits for the market management of resources, but we cannot fail to note that someone is always left “holding the bag” of excess or “unforeseeable” risk, which exists even if you ignore it.

If derivatives play a role in the transmission of monetary and fiscal impulses or the effects of market agents’ choices, as the logic and the empirical evidence suggest, then it is necessary to comprehend this role and supplement the rules for monetary and fiscal policy and, more generally, the pursuit of growth and employment.

Derivatives and money. The demand for derivatives works an efficient substitute either for the speculative and transaction demand for money. Then they are subject to the perils of Keynes’s “liquidity paradox” whereby everybody thinks he is liquid, in part because they hold derivatives, but the system as a whole is not. Naturally, today’s central banks are not those that caused or at any rate aggravated the crisis of 1929. They know they must serve as lenders of last resort when the market suspects that the system overall may not be liquid and tests it in the area of derivatives used for monetary and other purposes; or when it is swept by panic originating in the derivatives sector. Hunter and Marshall (1999) highlighted the delicate nature of this role. Again, let us cite in support of this thesis the massive interventions by central banks in the subprime mortgage crisis, after seeing how effective they were in resolving the LTCM crisis (but less in the Asian crisis).

It is hard to deny that derivatives alter investors’ preference schedule in monetary matters, hence their balance-sheet equilibria. The authorities should seriously consider bringing the derivatives market into their forecasting models to perfect the logical and empirical foundations of their policy decisions, as they did following the Second World War when they saw the need for models to explain the working of the economy. A comparable process of inquiry on derivatives is hampered by the lack of statistics, itself the product of the persistence with which their macroeconomic effects have been neglected and their microeconomic benefits exalted.

Derivatives and fiscal policy. The problem of the macroeconomic effects of derivatives goes beyond the monetary policy transmission mechanism, and the Guido Carli Association’s research project dealt with fiscal policy as well, analyzing the effects of derivatives on capital
formation, the heart of the growth mechanism.

A first inquiry into the use of derivatives by fiscal policy makers found some techniques that can assist in the proper conduct of budget policy, but also some that have all the earmarks of devices for circumventing orthodox fiscal policy constraints, and still others that would appear to be outright accounting abuses. The positive techniques – though still, in our view, fiscally improper – include Italy’s mega-swap on public debt interest rates in 1998, whose very substantial revenue enabled the country to bring the deficit below the Maastricht threshold of 3% of GDP. The definitely deleterious techniques include the derivative transactions effected by some Italian local governments during election campaigns, procuring ready cash for “electoral” spending and deferring the cost to future budgets, to the evident detriment of municipal finances, especially when the cost would have to be paid by a new set of incumbents. Elsewhere, governments have used derivatives to inflate the size of their official reserves, so greatly confusing their valuation as not to realize the potential repercussions they were facing. This (together with excessive resort to short-term borrowing) was one feature of the Asian crisis of 1997, threatening an international contagion and a possible systemic crisis.

It is worth underscoring that these ways of circumventing the rules, these abuses of the instrument, are suggested by market agents themselves; it is unlikely, in fact, that governments, especially local governments, could have thought them up and requested them. Anyway, in politics the learning process through word-of-mouth is extremely rapid, and many central and local governments quickly mastered a series of sophisticated transactions that they are now capable of requesting.

The study of derivatives’ impact on fiscal policy concludes that like monetary indicators the public debt and budget balances, which are the crucial fiscal policy indicators, have lost significance. Ultimately the nature and size of traditional budgetary packages escape understanding, with an undoing or at least weakening of the empirical relation between instruments and objectives not unlike that decried by Alan Greenspan for monetary policy. Fiscal policy-making is already complicated enough owing to the cumbersome democratic process and the political and social pressures that are brought to bear; the last thing it needs is to be further burdened by the improper use of derivatives. The logical limits and practical rules on the use of derivatives by fiscal policy-makers therefore need to be defined; that is, the operation of this market within
the fiscal policy transmission mechanism must be taken into logical and theoretical account. In this sphere, much remains to be done.

Derivatives, capital formation and growth. The circle of this wide-ranging study of derivatives closes with a projection of the results for monetary and fiscal policy onto the real economy. We assume that “Tobin’s q” provides a serviceable explanation for investment decisions and derive some conclusions concerning the relation between profit rates and interest rates.

If, as we hold, derivatives affect the rate of interest, it necessarily follows that they also affect the real rate of capital formation. As we know, Tobin’s q indicates that if the rate of return on existing investments is higher than the rate of interest, investors will prefer to invest in real capital goods; if it is lower, they will buy securities representing existing capital, driving their market value up. Accordingly, it is not enough to know how much derivatives affect interest rates, and in what direction; we must also know how they relate to the return on real capital.

On the second question – who causes what – Associazione Guido Carli has formed a working group under Professor Giangiacomo Nardozzi of Milan Polytechnical University to inquire into the direction of causality between profit and interest rates. Its two progress reports (Nardozzi 2002 and 2007) offer support for the thesis that the interest rate dominates the profit rate, especially recently when the “financial sector has made a fundamental contribution to economic growth” as Governor Draghi notes (Banca d’Italia 2007). But this dominance differs by area and by period, according to a theory with which we largely agree. There is no permanent condition of economic relations, especially when money is involved.

Derivatives and price. The idea that we share is that set forth by Piero Sraffa in a short chapter to The Production of Commodities by Means of Commodities (1960). Sraffa holds that there is a force driving the income distribution – which, combined with technical innovation, is the source of prices and the engine of growth – that depends alternatively on entrepreneurs or on the monetary authorities. If the former are strong enough to set the profit rate at the level they want, the rate of interest must adapt. If this power rests in the hands of the monetary authorities, the reverse happens. As democratic parliaments (if they are democratic) originated in order to determine the distribution of income
via the budget or legislation and thus have the power-cum-duty to do so, this analysis raises highly delicate problems concerning the limits to market freedom and the rationale for the independence of central banks.

Without denying the importance of these questions, we leave the response to other occasions and other disciplines, principally political philosophy. Here we need only argue on the rational plane that since the development of financial derivatives nothing is the same in economics or economic policy. Without taking derivatives into account, no economic reasoning can be either logical or realistic – no economic reasoning whatever. Yet even in monetary economics writings that ignore this stricture abound and stake their claims to authority.

Not even the repeated crises or the warnings of authoritative market participants and leading policy makers have moved the economics profession. On the one hand, macroeconomic forecasters continue to make their predictions without factoring in the role of derivatives; and on the other, the academic world studies every possible phenomenon except for derivatives, and in teaching about them mentions only the microeconomic aspects or their market positioning. The macroeconomic effects on investment and real growth are ignored.
References

BANK FOR INTERNATIONAL SETTLEMENTS (1994), “Macroeconomic and monetary policy issues raised by the growth of derivatives”,


EUROPEAN CENTRAL BANK (2007), Some reflections on the development of credit derivatives, Keynote address J.C. Trichet, Boston, April 18.


Fifth Colloquium
FIRST PAPER
FINANCIAL AND REAL INTEGRATION

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Abstract

We examine the relationship between real and financial integration using new measures of each. Real returns to labor and capital across countries from 1982 to 1997 are measured using productivities of capital and labor from trade data. The black market exchange rate is the particular measure of financial integration which we suggest and use. We find an increase in the black market premium seldom is associated with a relative increase in the productivity of either labor or capital. We also find more evidence of convergence to equality for returns to capital than for returns to labor.

Acknowledgement

We thank the Associazione Guido Carli and Fondazione Cesifin Alberto Predieri for supporting the Fifth Colloquium at which this paper was presented and at which we received many helpful comments. Helpful comments also were received from participants at the INFINITI conference at Trinity College, Dublin when we presented the paper there. We thank the Federal Reserve Bank of Atlanta for research support and Linda Mundy for editorial assistance. Baier appreciates financial support from the National Science Foundation for related research. The views expressed here are the authors’ and not necessarily those of the Federal Reserve Bank of Atlanta or the Federal Reserve System. Any remaining errors are the authors’ responsibility.
In this paper, we use the relative factor content of international trade to estimate the productivities of capital and labor and examine how changes in them from 1982 to 1997 are related to financial integration. There is little information available on factor returns that is comparable across countries but available data on factor returns are correlated with these productivities of labor and capital computed from trade data.¹

We start with a standard international-trade model: the Heckscher-Ohlin-Vanek (HOV) model. In this standard model of an integrated world in which all countries produce all goods, trade in factor services is a function of a country’s endowments relative to its consumption of factor services, and trade in goods is a substitute for direct trade in factor services and for migration of factors. With identical technologies, the HOV model implies that 1. A country has a comparative advantage in producing goods that use its relatively more abundant factors, 2. A country is a net exporter of its relatively abundant factors’ services and 3. Factor returns are equalized across countries.²

Empirical tests of the HOV model examine the relationship between endowments and the observed pattern of trade and find that the HOV model explains little of the direction or magnitude of trade.³ In addition, violations of absolute factor price equalization are virtually self-evident in the data on measured wages across countries.

Hence, there must be explanations of the factor content of trade besides the simple HOV model.

Half a century ago, Leontief (1953) suggested a possible explanation for the HOV model’s poor performance — some countries may use factors of production more efficiently than others. An innovative series of papers by Bowen, Leamer and Sveikauskas (1987) and Trefler (1993, 1995) followed Leontief’s suggestion and introduced technological differences into the HOV model. Trefler (1993) shows that factor-augmenting technology can equate actual trade in factor services and the theoretically implied trade in factor services. Allowing for factor-augmenting technological differences implies that factor prices are equalized in terms of relative efficiency units. For example, if labor-

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1 Baier, Dwyer and Tamura (2007) provide references.
2 At the level of aggregation used for the countries in this paper, there are no industries with zero production. This suggests to us that the conditions for factor price equalization are likely not to be wildly unrealistic in the context of the differences across countries envisaged in the theory.
augmenting technology is five times higher in the United States than in Mexico, workers in the U.S. will receive a wage that is five times greater than the wage paid to workers who are in Mexico and otherwise identical. Trefler presents evidence that there is a strong relationship between relative factor payments and relative factor-augmenting productivity.

In an earlier paper, Robert Tamura and we (Baier, Dwyer and Tamura 2007) also show that these measures of factor-augmenting technology obtained from trade theory are related to total factor productivity. Theoretically, factor productivity implied by trade is similar to total factor productivity in the following sense: If factor productivity indicates that a unit of capital in the United States is twice as productive as a unit of capital in the Philippines, then the return to capital will be twice as high in the U.S. as in the Philippines. Similarly, for a given level of capital in the U.S. and the Philippines, if total factor productivity in the U.S. is twice as high as total factor productivity in the Philippines, then capital and labor’s returns can be twice as high in the U.S. Therefore, total factor productivity has the same effect on the returns to capital and labor as factor productivity from the HOV model.

In that earlier paper, we examined the determinants of factor productivity across countries. We found that protection of private property rights is the single most important explanation of cross-country differences in factor productivity in 1997.

Democracy has little relationship with trade productivities once property rights are included in the analysis. Measures of geography other than distance to a large market are not important.

In this paper, we examine changes in the productivity of capital and labor over time and how they are related to a particular measure of financial integration.

We find that capital productivities around the world are more similar than labor productivities in 1982 and also show much more evidence of converging from 1982 to 1997. Measuring financial integration for a set of countries that includes many different levels of development of financial markets is difficult. We suggest black market exchange rates as a measure of financial integration. Overall, black market exchange rates deviate less from official exchange rates by 1995 than they did in 1980.

We find some evidence that this convergence of black market exchange rates to official rates has been associated with convergence of
capital productivities.

In the next section, we summarize how the productivities of labor and capital are computed. We then summarize the data on black market exchange rates and examine the data for an association of changes in black market exchange rates and capital and labor productivities.

**PRODUCTIVITIES OF LABOR AND CAPITAL**

The productivities of labor and capital are those implied by international trade in goods given assumptions about technology and consumption of goods across countries.

**HOV Theory and Productivity Differences**

The details of the computation of labor and capital productivities are available elsewhere (Trefler 1993; Baier, Dwyer and Tamura 2007.) In this section, we outline how the productivities are computed.

The Heckscher-Ohlin-Vanek theory of trade can be used to generate measures of productivity based on a comparison of the measured factor content of trade and a predicted factor content of trade. The basic analytical construct is a transformation of trade in goods into implicit trade of the factor services used to produce the goods.

The computations assume that countries have identical constant returns to scale production functions, markets are perfectly competitive, and the world is free from barriers that distort trade. This means that the measures of productivity reflect tariff and non-tariff barriers or inducements to trade. To rule out corner solutions in which there is no trade in some goods, the analysis assumes that endowments of factors across countries are distributed in such a way that there is an integrated world equilibrium with all countries producing some of all goods. The analysis proceeds by comparing the measured factor content of trade and a predicted factor content given the endowment of factor services in a country.

The measured factor content of trade is determined from actual trade in goods at a detailed level. A presumed common technology of an input-output matrix of coefficients for the United States is used to determine this measured factor content of trade.

The predicted factor content of trade is a function of factor
availability, production and domestic consumption. In the baseline HOV model, there are no differences in how efficiently factors are used across countries and resources are fully employed. If people in all countries have identical and homothetic preferences, country i’s expenditure is proportional to its share of world expenditure. The predicted factor content of trade is factor use in domestic production minus factor use in domestic consumption.

The measured factor content of trade need not equal the predicted factor content of trade. These differences are the basis of the numerous tests of whether the HOV model characterizes actual trade.

An alternative way of posing the issue is to ask what differences in technology or productivity are necessary for the measured and predicted factor content of trade to be the same, an innovation due to Trefler (1993.) The measured factor content of trade is the same as the measured content of trade based on the common technology above. Suppose that technology differences are factor augmenting and the same across industries in a country. Then the predicted factor content of trade by a country adjusted for differences in productivity involves the unknown productivities for each factor for each country. Equating the measured and predicted factor contents of trade provides a productivity matrix for all countries for all factors.

A normalization is necessary because the productivities can be determined independently for all but one country. It is standard to normalize the productivities to one for the United States, which is natural given that the “common technology” is measured from United States input-output tables. Measuring the productivities by the average for all the countries is one obvious alternative normalization. For our purposes of measuring productivities over time, it is more informative to measure the productivities relative to the average for all countries rather than relative to the U.S.

If measured relative to the U.S., then productivity change in a country is measured relative to productivity change in the U.S. If measured relative to the average, then productivity change in a country is measured relative to productivity change in the average country.

4 While not obvious from this development, the estimates of productivity for a factor are independent of mismeasurement of the quantities of other factors and their productivities.
Data

As is standard in most empirical trade research, the data used in this study are drawn from a variety of sources. All data are for 79 countries in each year based on up to 32 industries of traded goods. The data on trade flows are from Feenstra (2000.) For inputs, we use data for the capital stock and the labor force measured in effective labor units. The capital stock measures are constructed using the perpetual inventory method with an annual depreciation rate of 13.3 percent, as in Leamer (1984), using real investment data from Baier, Dwyer, and Tamura (2006). Aggregate labor force is converted into effective labor force units by multiplying the labor force by exp(\(\varphi(\text{educ}_i, \text{exper}_i)\)) where \(\text{educ}_i\) is the number of years of schooling for the average worker in country \(i\), \(\text{exper}_i\) is the average level of experience in country \(i\) and exp(\(\varphi(\text{educ}_i, \text{exper}_i)\)) reflects returns to education and experience. Data on the labor force are from the World Bank (2002) and data for the conversion to effective labor are from Baier, Dwyer, and Tamura (2006).

Our construction of the direct and indirect input requirement of factors to produce goods is standard (Bowen, Leamer and Sveikauskas 1987). Input requirements are based on the 1982, 1987, 1992 and 1997 input-output tables for the United States. The stocks of capital by industry in the U.S. are from the U.S. series “fixed reproducible tangible wealth.” To equate the total of these capital stocks and our computed U.S. perpetual-inventory aggregate capital stock, the capital stock in each industry is multiplied by the ratio of the U.S. perpetual-inventory aggregate capital stock to the total of the U.S. capital stocks from fixed reproducible tangible wealth. This results in a sum of the capital stocks by industry in the U.S. equal to our estimate of the aggregate U.S. capital stock. Data for the U.S. labor force employed in each sector are from the National Income and Product Accounts of the United States and the Bartelsman, Becker, and Gray (2002) productivity database for 1982, 1987, 1992 and 1997. The total labor force is adjusted to equal

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5 The derivatives of \(\varphi(\text{educ}_i, \text{exper}_i)\) are the returns to an additional year of schooling or experience that can be estimated from Mincerian wage regressions. As in Hall and Jones (1999), Debaere and Demiroglu (2003) and Baier, Dwyer and Tamura (2006), we assume that the return to education for the first four years of schooling is 13.4 percent, 10.1 percent for the second four years and 6.8 percent for all years of education above the 8th year. As in Bils and Klenow (2000), we assume the return to experience is quadratic.

Each country's share of world consumption is its share of absorption of goods and services in all countries.

CAPITAL AND LABOR PRODUCTIVITIES

Estimated Productivities

Table 1 shows the list of countries for which we have computed productivities. The countries are from quite different parts of the world, with quite different levels of incomes and associated development.

Figure 1 shows the labor and capital productivities for each of the countries for 1982, 1987, 1992 and 1997. All of these productivities are normalized so that the average productivity of labor and the average productivity of capital are unity in each year.

It is apparent from Figure 1 that there is a substantial amount of variation that at first glance has little to do with the productivity of labor and capital as commonly understood. For example, Madagascar — MDG in the graphs — has the highest capital productivity in the world in 1982, 1987 and 1992 and one of the highest in the world in 1997. Why? With the exception of being an importer of crude oil and an exporter of petroleum products, Madagascar primarily exports agricultural products and imports goods for use on the islands. Switzerland (CHE in the figures) has the highest labor productivity in the world. These figures are not obviously implausible. It is arguable that, at least in some cases, the productivities are distorted by resources such as oil deposits that are not included in the calculations.

Table 2 provides summary statistics on the productivities. The standard deviation of the productivity of labor increases from 1982 to 1987 and then changes little by 1997. The range increases with the lower end of the range lower in 1997 than in 1982 and the upper end of the range virtually the same in 1982 and 1997. In some ways, this is surprising given the emphasis on globalization. The standard deviation of the productivity of capital, though, declines from 1982 to 1997. The range of the productivities of capital declines due to a decrease in the
maximum. Probably the standard deviations are a better indicator of the changes in the distribution than the ranges, which can be affected by idiosyncratic variation in individual countries, but there is little evidence of convergence of the labor productivities.

It might seem that the apparent convergence of capital productivity could be a reflection of the decline in the calculated productivity of capital in Madagascar. Such is not the case. The standard deviations of capital productivity without Madagascar for each year are 1982, 0.809; 1987, 0.788; 1992, 0.492; and 1997, 0.523. While not as large as the decline in Table 2, the decrease in the standard deviation still is substantial.\(^6\)

The median labor productivity has declined, which means that labor productivity in the typical country has not increased as rapidly as it has in these countries on average.

At the same time, the median capital productivity has increased, approaching one by 1997. This is an interesting difference.

The correlations of labor and capital productivities increase consistently from the low value of 0.04 in 1982 to the highest value of 0.39 in 1997.

Figures 2 and 3 provide a different perspective on the distributions of capital and labor productivities.

The distributions of labor productivity and capital productivity are quite different.

The labor productivities are skewed, with more countries below the average than above it. This figure provides some perspective on the reason for the different behavior of the medians of the distributions of labor and capital productivity. Median labor productivity actually fell from 0.62 in 1982 to 0.48, 0.49 and 0.50 in 1987, 1992 and 1997. At the same time, median capital productivity rose from 0.72 and 0.70 in 1982

\(^6\) Steven Ongena suggested treating some additional high capital productivity countries as outliers. We deleted high initial capital productivity countries in addition to Madagascar, namely Trinidad and Tobago, Sierra Leone and the Democratic Republic of the Congo. With these additional observations deleted, the standard deviation of capital productivities decreases uniformly from 0.667 to 0.448. The estimated coefficients of autoregressions similar to those in Table 3 show less mean reversion for capital productivity, which is to be expected. (The autoregressive coefficient is 0.87). Interestingly, the constant term in the regression for labor productivity is small relative to its mean with these four countries deleted. The more general issue of the effects of natural resources and specialized production arrangements on these estimated productivities is an interesting question that we are examining in our continuing research.
and 1987 to 0.89 and 0.97 in 1992 and 1997. The arithmetic averages, of course, are one throughout.

Standard convergence regressions also lead to the conclusion that capital productivity has converged and labor productivity has not. Table 3 presents a variant of standard unconditional-convergence regressions, which basically are unit-root tests.

The regressions are run for 1997 as the final year and 1982 as the initial year. It is most informative to present the regressions in levels with the t-ratio for the Dickey-Fuller test and we do that in the table. The autoregressive coefficients themselves highlight the difference. The coefficient for labor in 1982 is very close to one. The coefficient for capital in 1982 is well below one. The constant term in the labor regression suggests that there is a very large downward trend in labor productivity, which is dubious at best given Figure 2. There definitely is a downward moment of the relatively low labor productivities, but this cannot translate into a downward trend because the productivities have a lower bound of zero.

There are, of course, lots of reasons to be dubious about these regressions for generating conclusions. Nonetheless, the results are striking in terms of the question under consideration. A natural result of integration of economies is convergence of returns to factors of production. Has there been integration in the sense that capital productivities have become more similar? The answer fairly clearly is “yes”. Has there been integration in terms of labor productivities? Not obviously!

In one sense, this result is not surprising. Financial markets have become more integrated and this can have a fairly direct effect of raising low returns to capital in some countries by supporting an outflow and lowering high returns in other countries by supporting an inflow.

In another sense, this result is surprising if taken at face value. If the marginal product of capital increases because of inflows of capital, this increases the demand for labor and the marginal product of labor should increase unless the elasticity of supply of labor is infinite.

Are capital and labor productivities this disconnected? A little bit

7 Regressions for the logarithms of the productivities lead to the same conclusion concerning convergence of productivities.
8 We thank Jouko Vilmunen for pointing this out to us.
9 Not the least of these reasons are shortcomings in this context of classical statistical analysis compared to a Bayesian approach along the lines of Dwyer et al (2007).
of evidence says not. The correlations of changes in labor and capital productivities are indeed positive. The correlation of changes in labor productivity and capital productivity is 0.38 from 1982 to 1997. While hardly overwhelming, this correlation is not zero. \(^{10}\) The correlation of changes in the logarithms of the productivities is quite a bit higher, 0.80, suggesting that there is quite a bit of force to this argument, the seeming disconnect between the changes in the distributions of the productivities aside.

Figure 4 illustrates the issue in a different way. Figure 4 shows the growth rate of labor and capital productivity in each country for 1982 to 1997. Many countries had rising labor and capital productivity. More than a few countries had falling labor and capital productivity. It is worthwhile recalling that the productivities are measured relative to the average in each year, so falling productivity does not mean that returns to labor and capital falls. Falling productivity in Figure 4 means that returns to labor and capital fell relative to the average. While not as bad as falling absolutely, falling behind hardly is attractive. More than a few countries also had falling labor productivity and rising capital productivity. Only two, Cyprus and Singapore, had rising labor productivity and falling capital productivity.

Perhaps a measure of financial market integration will be informative about the integration of capital markets, and possibly labor markets as well.

FINANCIAL INTEGRATION

With such a disparate set of countries, it is not immediately obvious how to measure financial integration.

The best measure would be the set of prices of various risk factors in foreign markets.

This has a solid theoretical basis and an unambiguous interpretation. Such measures based on markets for stocks and bonds are not likely to be very useful for our set of countries though. A country such as Vietnam for example is unlikely to have representative data from financial markets to permit reliable and comparable estimation

\(^{10}\) The p-value for a test that the correlation is zero is 0.06 percent, far less than usual statistical significance levels.
of the prices of risk factors. The same statement can be made for many other countries in our set of data.

An alternative measure is the openness of domestic financial markets to foreigners. This is the path followed by Edison and Warnock (2003). Examination of their data reveals though, that even this measure is not available for many markets, no doubt because some of our countries do not have organized exchanges with data available. Instead of going down this road, we examine the foreign exchange market as a plausible candidate for informative data.

We suggest that the black market premium is likely to be a useful measure of financial integration. A black market is prima facie evidence of an imperfectly functioning market for foreign exchange. In addition, a black market for foreign exchange implicitly indicates that some transactions occur at more favorable exchange rates, which is itself an indication of likely favoritism in the allocation of preferential exchange rates and corruption in at least some cases. Finally, a black market in foreign exchange is likely to be associated with other policies that hinder the efficient operation of a country’s economy and would be reflected in low productivities of labor and capital.

**Data on Black Market Exchange Rate**

The data on the black market exchange rate are from a compilation of black market premia by Gwartney and Lawson (2005). These data primarily are from various issues of the *MRI Bankers’ Guide to Foreign Currency*. In this source, the black market exchange rates are estimates for the parallel domestic market for foreign exchange (Monetary Research Institute, 2005). Gwartney and Lawson (2005, p. 177) supplement these data by data from other sources when necessary.

**Preliminary Analysis of the Data**

Figure 5 shows the black market premia for 1980 and 1995. These dates are two years before the first and two years before the last measures of capital and labor productivities. To facilitate later analysis, the figures show gross premia in percent, which means that the “premium” is the black market exchange rate relative to the official exchange rate in percent. As a result, a gross premium of 100 percent means that the “black market exchange rate” is the same as the official
exchange rate.

It is immediately obvious in Figure 4 that the frequency of black market exchange rates well above the official rate has decreased markedly over the fifteen years covered by the figure. Many countries had substantial black market premia in 1980 and not many had much in the way of black market premia by 1995. This strikes us as prima facie evidence of greater effective financial integration among economies.

Figure 6 shows the distribution of the black market premia in 1980, 1985, 1990 and 1995. It is clear that there is substantial movement toward black market gross premia close to 100 percent.

In one sense, the histograms are less revealing than they could be. Even in 1995, there are quite a few countries that have gross premia above 100, in fact 41 countries.


FINANCIAL AND REAL INTEGRATION

Figure 7 shows the relationship between changes in the black market premium from 1980 to 1995 and capital productivity from 1982 and 1997. The figure shows relative capital productivities and the relative black market premium. An increase in capital productivity is an increase in capital productivity relative to the average for the world. The gross black market premia are never less than 100 percent, so a decrease in the relative black market premium is a decrease toward one hundred in all cases and an improvement in integration. The horizontal and vertical reference lines divide the figure into four quadrants. The upper left quadrant represents an improvement in capital productivity and the black market premium, the upper right quadrant represents an improvement in capital productivity and a worsening of the black market premium, the lower left quadrant represents a worsening of capital productivity and an improvement in the black market premium and the lower right quadrant represents a worsening of capital productivity and a worsening of the black market premium.

Few countries have higher black market premia in 1995 than in 1980. In fact only Haiti, Venezuela and Nigeria have black market premia that increased substantially over those years. Each of these countries has a lower relative capital productivity in 1995 than in 1980.
It is clear that a fall in the black market premium is not a guarantee of an improvement in relative capital productivity. Countries with improvements in their black market premia have increases and decreases in relative capital productivity. Relatively few countries have higher black market premia in 1995 than in 1982, but all of the countries with large increases in black market premia have lower relative capital productivity in 1997 than in 1982. No country with a higher black market premium in 1995 has a higher relative capital productivity in 1997.

Figure 8 shows a similar graph for labor productivity. Venezuela and Nigeria also have lower labor productivity, although Haiti has higher labor productivity.

Does this pattern hold for subperiods?

Figure 9 shows the changes in capital productivities and black market premia for the three subperiods. There are a few exceptions, but it still is true that increases in capital productivity are seldom associated with increases in the black market premium.

Figure 10 shows a similar result for labor productivity.

Table 5 presents the results of Chi-square tests of association between changes in black market premia and changes in labor and capital productivities. The changes in black market premia are divided into three classes: falling, unchanging and increasing.

No change is quite likely since some countries never have any deviation from official exchange rates. The changes in productivities are divided into two classes: rising and falling. Because it is a test of association, these test results do not impose any constraints such as linearity. We interpret the p-values in Table 4 as providing some support for the importance of black market premia for productivity.

CONCLUSION

Some results seem clear, even though more definitive conclusions await further research.

Capital productivities around the world have tended to converge more than labor productivities from 1982 to 1997. This is so even though

11 The fraction of countries with no change in the black market premium is 20 percent from 1980 to 1985, 25 percent from 1985 to 1990 and 38 percent from 1990 to 1995.
capital productivities were more similar than labor productivities in 1982.

Financial integration is a possible explanation for the convergence of capital productivities.

Measuring financial integration for a set of countries that includes many different levels of development of financial markets is difficult. We suggest black market exchange rates as a measure of financial integration. Black market exchange rates deviate less from official exchange rates by 1995 than they did in 1980. We find some evidence that this convergence of black market exchange rates has been associated with convergence of capital productivities.
References


Table 1  
Countries in This Dataset

<table>
<thead>
<tr>
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<th>Country</th>
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Table 2
Summary Statistics on the Estimated Labor and Capital Productivities

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<tr>
<th>Year</th>
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<th>Median</th>
<th>Minimum Value</th>
<th>Maximum Value</th>
<th>Standard Deviation</th>
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<tr>
<td>1982 Labor Productivity</td>
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<td>0.619</td>
<td>0.069</td>
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<td>1987 Labor Productivity</td>
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<td>0.484</td>
<td>0.040</td>
<td>4.908</td>
<td>1.082</td>
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<td>0.495</td>
<td>0.042</td>
<td>4.327</td>
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<tr>
<td>1997 Labor Productivity</td>
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<td>0.029</td>
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<td>1982 Capital Productivity</td>
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<td>0.717</td>
<td>0.235</td>
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Correlations of Productivities

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<td>1992</td>
<td>.304</td>
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<td>1997</td>
<td>.393</td>
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There are 79 countries for each of the years. By construction, the mean labor productivity and mean capital productivity for each year are one.

Table 3
Convergence of Productivities to Means
1982 to 1997

<table>
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<tr>
<th>Dependent Variable</th>
<th>Constant</th>
<th>Coefficient 1982 Productivity</th>
<th>t-ratio for change</th>
<th>R²</th>
<th>se</th>
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<td>1997 Labor Productivity</td>
<td>-8.011</td>
<td>1.011</td>
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<td></td>
<td>(.088)</td>
<td>(.065)</td>
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<td>1997 Capital Productivity</td>
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<td>(.067)</td>
<td>(.044)</td>
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The t-ratios of parameters are in parentheses.
### Table 4
#### Summary Statistics on Black Market Exchange Rates
1980 to 1995

<table>
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<th>Year</th>
<th>All Black Market Exchange Rates</th>
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<table>
<thead>
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<th>Black Market Exchange Rates Not Equal to Official Exchange Rate</th>
<th>Number of Observations</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
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<td>1980</td>
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<td>1985</td>
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### Table 5
#### Tests for Association Between Productivities and Black Market Exchange Rates
1982 to 1997

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<tr>
<td>1992 to 1997 Labor Productivity</td>
<td>3.779</td>
<td>.151</td>
</tr>
<tr>
<td>1992 to 1997 Labor Productivity</td>
<td>8.313</td>
<td>.016</td>
</tr>
<tr>
<td>1992 to 1997 Labor Productivity</td>
<td>3.847</td>
<td>.146</td>
</tr>
<tr>
<td>1982 to 1987 Capital Productivity</td>
<td>3.785</td>
<td>.151</td>
</tr>
<tr>
<td>1987 to 1992 Capital Productivity</td>
<td>9.944</td>
<td>.007</td>
</tr>
<tr>
<td>1992 to 1997 Capital Productivity</td>
<td>5.834</td>
<td>.054</td>
</tr>
</tbody>
</table>
Figure 1
Productivities of Capital and Labor
Figure 2
Labor Productivities in 1982 and 1997
Figure 3
Capital Productivities in 1982 and 1997
Figure 4
Growth Rates of Labor and Capital Productivities
1982 to 1997
Figure 5
Gross Black Market Premium
1995 and 1980
Figure 6
Distribution of Black Market Premia
Figure 7
Figure 8
Figure 9
Relative Black Market Rates and Relative Labor Productivities
By Five-years Periods
Figure 10
Relative Black Market Rates and Relative Labor Productivities
By Five-years Periods
The paper by Baier and Dwyer calculates normalized capital and labor productivity growth for the years 1982, 1987, 1992, and 1997 for 84 countries. The paper finds conversion in capital but not labor productivity and establishes an association between conversion in capital productivity to black (foreign exchange) market premia. The paper then asks the question if this conversion is related to financial integration? Clearly the paper addresses a very important topic. The questions I have pertain to the calculation of productivity growth and the use of the black market premia. I also have some suggestions for additional or alternative empirical specifications.

1. Calculation of Productivity Growth

One of the key assumptions in the calculation of productivity growth is the presumed common technology of an input-output matrix of coefficients for the United States that is used to determine the measured factor content of trade. This assumption may or not be innocuous but it may be fruitful to document the robustness of the results to this choice, especially because this paper compares productivity growth over somewhat longer time windows. Maybe other papers have demonstrated the robustness of findings and ranking to this assumption, in which case these papers should be cited.

A second issue in the calculation of productivity growth concerns the possible presence of outliers.
Visual inspection reveals the potential importance of one to three countries that may determine the findings that variation decreases (the lines on the figure are drawn to correct for the differences in scaling). These countries themselves (Madagascar and Uganda for example) are somewhat unexpected in obtaining a high capital productivity, but in addition their change in productivity may drive the main findings of convergence.

While difficult to tackle, and not uncontroversial in itself, a closer analysis of the impact of these data points seems warranted. Statistical tests could be used to determine if removal is reasonable (Chatterjee and Hadi (1986)), after which the convergence regressions should be re-run.

2. Black Market Premia

To use black market premia is clearly very nice. Though the motivation for its use is somewhat weakened if one realizes that in
many countries convertibility drives the premium to zero, or “100” in the authors’ normalization. Hence it is not clear from an econometric point of view if there is more information in the black market premia, than in stock or bond market information which the authors choose not to use, as a few countries do not feature active security markets with reliable price information. My suggestion would be to also examine the subset of countries that do have security price information.

Given that black market premia are not that often used as a measure of financial integration it may also be interesting to discuss this market further to explore whether there were shifts in demand or supply or changes in the micro structure of this market that coincided with the trends of financial integration, i.e., to discuss whether there are omitted variables that need to be considered when assessing the association between changes in capital productivity and financial integration.

3. Association to Causation?

Finally, it may be interesting to explore why and how convergence in capital productivity growth occurs. In particular, from a policy point of view it may be key to understand which policy measures results in the quickest convergence.

Using the Chronology of Important Financial, Economic and Political Events in Emerging Markets compiled by Bekaert and Harvey (2004) or indicators compiled by Barth, Caprio and Levine (2001) one potentially could for many countries identify key regulatory events of financial market opening to regress the difference in year $t$ between the maximum and the country $i$’s capital productivity growth $\Delta(CP_{\text{Max}} - CP_i)$ on financial market openness indicators for country $i$ in year $t-1$. While legal and regulatory changes are never fully exogenous (as domestic or foreign parties lobby and intervene in the law making process), initial changes in emerging markets were often inspired or guided by exogenous common market programs or international institutions. In this way the paper can aim to identify which changes are mostly affecting capital productivity growth.
4. Conclusion

This is clearly an interesting paper that broaches key topics in the finance and growth literature. The use of the black market premia is clever. Nevertheless, many extensions seem possible.
References


Very interesting Paper. Correlation between real and Financial Integrations have not been done by the past. It is a new idea and new concept.

1. Real Integration

Concept:
If the variation of the productivities of Capital and Labor across countries are getting smaller, there is an real integration.

=> operational definition:
If std (productivities of K or L) becomes smaller then, there are convergence across countries.

=> Table 2

Real Integration in K: Capital Productivity: Sd decreases; yes
Real Integration in L: Labor Productivity: sd does not decrease; NO

Table 2
Summary Statistics on the Estimated Capital and Labor Productivities
There are 79 countries for each of the years. By construction, the mean labor productivity and mean capital productivity for each year are one.

2. Financial Integration

Measure:
- black market premium
  = black market exchange rate/official exchange rate (data are from Gwartney and Lawson, 2005)
- 100% means that black = official exchange rate
- > 100% : black market premium
- 1985: many countries > 100%
- 1995: more and more = 100%
- Yes, there is a financial convergence;
  Convergence to 100% denotes the Financial Integration

3. Are they related?

- Weakly yes in capital productivity
- No in labor productivity

Some Discussions

- Do we need to separate the countries into regions? Productivities and their std dev.s are quite different in different regions. There are high and low level prod. regions.
- Will high level of productivity countries have low std dev. and thus converge fast? Or vice versa? (In income convergence literature, high GDP per capital countries grow slowly)
And their studies to explore

- Why is labor productivity not convergent
- Std(labor prod) = f(x1, x2...)
- Std(capital prod) = f(z1, z2...)
- Though this is not the purpose of this paper, this helps us to investigate why labor market integration is not correlated with financial integration.

4. The non-convergence of Labor productivity could cite some anecdotal evidence, reports etc from

- The International Labor Organization (ILO) says:
- While productivity levels have increased worldwide over the past decade, gaps remain wide between the industrialized region and most
others, although some regions have begun to catch up, a new ILO report says, adding that major cause of world poverty is waste of workers’ productive potential

- ILO is the tripartite UN agency that brings together governments, employers and workers of its member states in common action to promote decent work throughout the world.

5. **Black market premium (BMP):**

black market of exchange rate exists because of capital control. Once the country deregulates the capital control, most of time, black market will be gone.

- Thus, in developing country, BMP could be more like a step function: more than 100% before the deregulation and is close to 100% after it.
- In some countries BMP change little, like US
- In some countries, BMP are step function, converge, like Taiwan
- In some countries, BMP remain large

If we have time series data, it might be a step function for some countries and changes little for other countries

---

**Figure 5**

Gross Black Market Premium
1995 and 1980
6. *maybe, we could cite some studies from Literature of Income Convergence?*

- For example:
  - Is the convergence here more related to
  - the *sigma convergence*?
  - If yes, they most often use the variation of coefficient, not std dev. (this paper talks about std dev, but I may overlook it)
  - Sometimes, using Theil index
  - Also, they use bootstrap to construct the confidence interval

7. *could the paper consider the possibility of Club convergence?*

**Beta:**
Club: Some countries form a group, such as OECD countries, and might have K-club convergence and L-club convergence
- Their financial integration may also converge in a group basis

8. *Table 3 examines the convergence by regression; it mentions about the unit root ...*

- Is it the panel unit root test? In the text, it says the unit root
- But seems slightly different from the standard panel unit root
- It seems to me that it is more like a beta convergence
- Negative relationship between the growth rate and the value of initial income
- I might be wrong but slightly clarification would be better
Table 3
Convergence of Productivities to Means
1982 to 1997

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Constant</th>
<th>Coefficient 1982 Productivity</th>
<th>t-ratio for change</th>
<th>R²</th>
<th>z₀</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997 Capital Productivity</td>
<td>0.731</td>
<td>0.269</td>
<td>-16.338</td>
<td>.324</td>
<td>.447</td>
</tr>
<tr>
<td></td>
<td>(0.067)</td>
<td>(0.044)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1992 Labor Productivity</td>
<td>-8.011</td>
<td>1.011</td>
<td>0.017</td>
<td>.733</td>
<td>.921</td>
</tr>
<tr>
<td></td>
<td>(0.088)</td>
<td>(0.085)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The t-ratios of parameters are in parentheses.

9. This is an Association Study between real and Financial Integration, could it be possible to investigate:

- Is the correlation changing over time?
- Can correlation be accounted for by some variables?
- Are there any threshold effects if a multiple regression is used?

10. More literature discuss the rationale of why two defined integrations will be linked would be helpful

- Is it because financial liberalization?
- Is it particularly true in EU because of elimination of trade barrier?
1. Introduction

The hedge fund “industry” began when Alfred Winslow Jones founded the first such fund in 1949. Growth was slow for many years thereafter. In 1968, an SEC study reported 140 operating hedge funds; a 1984 industry survey identified only 68 (Connor and Woo (2003)). By 1990 (2000), approximately 500 (4,000) hedge funds had USD 40 billion (500 billion) in assets under management (Hildebrand (2007)). Hedge fund investing then exploded. By the end of 2006, the estimated number of funds stood at 9,500 worldwide, controlling assets of nearly USD 1.6 trillion. Although hedge funds originated in the U.S., they also operate in Europe and Asia. Between 2002 and 2006, the U.S. share of worldwide hedge fund assets fell from 80% to 65%, while the European and Asian shares rose to 24% and 8% respectively (FSF 2007, page 8). Ryback (2007, page 144) reports that Asian-domiciled funds’ assets under management grew from about USD20 billion in 2002 to USD130 billion at yearend 2006, when 335 Asian hedge funds owned more than USD50 billion in emerging Asian markets’ assets (that is, those outside Japan, Australia and New Zealand).

This overall growth in the hedge fund sector obscures an important fact: even while many new funds have emerged, many old funds have closed their doors. Garbaravi ius and Dierick (2005) estimate that the annual attrition rate for hedge funds varies between 5.2% and 14.4%, depending on the fund’s investment strategy. The Financial Stability Forum (2007, page 7) reports that 1,518 new hedge funds were founded in 2006 and 717 were liquidated. Both entry and exit were thought to

Thanks to Adrian Tobias for providing data. My discussants (Robert Marquez and Bob DeYoung) and the Colloquium participants offered helpful comments and suggestions. The usual disclaimer applies.
have been higher in 2005. The 2007 BIS Annual Report opines that “Investor interest in the sector appears to have leveled off over the past couple of years, and closures have outnumbered new funds launched.” (page 123)

Of course, the main driver of hedge fund growth was the potential for large net returns. The promise of high, market-neutral returns was especially alluring after the stock market crash of 2001, when market interest rates (and risk premia) fell to historically low level under such market conditions. Figure 1 plots monthly hedge fund returns, as estimated by the Bank for International Settlements.

![Figure 1: Hedge Fund Returns](image)

Source: BIS 77th Annual Report (2007), page 123. The indicated returns are annualized, 36-month rolling averages of the hedge fund returns net of fees and the return on 3-month U.S. Treasury bills.

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1 Hedge fund return series computed from standard data sources suffer from several potentially important biases, relating to selective reporting, asset misvaluations, rare-events type of risks (like insurance catastrophe bonds), and the lack of adjustments for correlations with other asset classes. See, among others, Malkiel and Saha (2005), Stulz (2007), Garbaravi ius and Dierick (2005).
As the number of funds and AUM have expanded, it seems likely that the additional competition exerts downward pressure on realizable returns. The declining return trends in Figure 1 are consistent with this idea.

Figure 2 compares the “all funds” rolling returns from Figure 1 to that on the S&P 500 index (again net of the return on 3-month bills). Over this period the average hedge fund provided a higher mean return (6.96% vs. 1.74%) and lower variability.

![Figure 2: Hedge Fund and S&P500 Index Returns](image)

Source: BIS 77th Annual Report (2007), page 123 and author’s calculations. The indicated returns are annualized, 36-month rolling averages of returns net of fees and the return on 3-month U.S. Treasury bills.

Despite their rapid growth, the hedge funds’ estimated $1.6 trillion assets under management (AUM) in 2006 is only a small fraction of U.S. (much less global) debt and equity securities outstanding. At the end of 2005, the entire hedge fund industry had fewer assets under management than the sum of the five largest banks’ proprietary trading desks (Hildebrand (2007), page 69). The defining
feature of hedge fund investments is that they specialize in taking risky, undiversified positions in what they believe to be mis-priced securities. In taking and managing these positions, hedge funds trade very actively. Despite their relatively small proportion of financial wealth under management, hedge fund account for a large proportion of the trades in certain risk markets, including equities, distressed debt, credit default swaps (CDS), and the lower (residual) tranches of asset-backed securities.

The impact of hedge fund operations on financial markets is difficult to identify. First, the funds are opaque. So no one knows their aggregate positions. Second, at least some hedge fund activities displace trades that had previously occurred through different channels. Connor and Woo ((2003)) point out that

some hedge fund strategies (for example, fixed income arbitrage) were previously the proprietary domain of investment banks and their trading desks. One driver for the growth of hedge funds is the application of investment bank trading desk strategies to private investment vehicles. (page 17)

All commentators agree that hedge fund trading has generated some positive externalities for other traders. Arbitrage strategies tend to make market prices more accurate and revealing. The funds’ trading also supplies the market with liquidity, which facilitates other investors’ diversification efforts. This liquidity has been particularly important in some formerly obscure contracts, such as CDS or catastrophe bonds, for which hedge fund trading has effectively created new markets. Other traders therefore have a new place to hedge.

Despite these apparent benefits during normal market operations, there remain suspicions that hedge fund activities are not always benign. Indeed, they have sometimes been viewed as disruptive. Some observers blamed hedge fund speculators for the Asian currency devaluations in 1997. A more recent concern involves the potential for exaggerated market volatility if events move against large hedge fund positions. For example, in 1998 officials feared that rapidly closing LTCM would generate large price swings in world financial markets. The New York Federal Reserve Bank therefore facilitated an agreement among the fund’s creditors to assure an

2 In this regard, the hedge funds compete with the proprietary trading desks of major money center banks.
orderly liquidation of its portfolio. More recently, well-publicized hedge fund losses have occurred with dramatic speed. One fund (Amaranth) lost $6 billion in October 2006 after betting the wrong way on natural gas futures. In June 2007, Bear Stearns closed two funds it was advising because subprime credit losses had drastically reduced their value. BNP Paribas suspended withdrawals from three of its own funds when the market for subprime mortgage securities largely disappeared.

This paper will describe the formation and operation of hedge funds, and discuss the policy issues associated with their activities. Section II describes the hedge fund industry's institutional features and its positive effects on financial market operations. Section III describes the main dangers of hedge fund activities perceived by market observers, and Section IV evaluates the likely effects of hedge funds on emerging market economies.

2. Institutional Features and Market Effects

Hedge funds organize themselves to minimize their exposure to explicit government oversight. Consequently, we have no unique definition for a “hedge fund.” Moreover, no regulator collects aggregate statistics; the available data describing this sector should be viewed as approximations.

A. Institutional Features

It is best to characterize hedge funds as “pools of investable capital organized to implement some risky investment strategies with limited diversification.” In order to avoid double taxation of earnings, most U.S. funds are formed as a partnership, whose tax obligations accrue only at the partner level. Outside the U.S., funds are commonly organized in low-tax jurisdictions. Hedge funds require access to financial markets, but this places few constraints on the legal and tax regimes under which they choose to operate. In order to avoid public scrutiny of their portfolios, hedge funds eschew public offerings; they sell partnership shares only to qualified investors through private placements. An investment adviser organizes a fund, which then hires the adviser to manage its capital. In the U.S., investment advisers with fewer than 15 clients need not register with regulatory authorities, and a hedge fund
counts as only one client.\textsuperscript{3}

It is tempting to define hedge funds in terms of their similarities to mutual funds or unit trusts. Both organizations seek attractive returns on invested capital, and both organizations are structured to avoid corporate taxation of investment income. Beyond these two features, however, the differences between mutual funds and hedge funds are more important than the similarities. The Investment Company Act of 1940 requires that publicly-offered mutual funds incorporate explicit investor protection features (Edwards (2006)). Funds wishing to solicit investments from the public must disclose their investment strategies and report their holdings on a regular basis. They may not change their basic investment strategies without approval from the current shareholders.

Investors can trade shares of the fund at the end-of-day estimated net asset value (for open funds) or at current market prices (for closed-ended funds). Mutual funds’ use of leverage and short sales are limited by law and regulations, and they may not compensate investment advisers on the basis of performance results.\textsuperscript{4}

Hedge funds differ from mutual funds in all four of these dimensions. They solicit investment privately from “qualified” individuals and institutions, which can (presumably) assess the fund’s risk-return tradeoff without mandated information disclosures. Hedge funds provide little public information about their investment policies or positions, and require advance notice before investors are permitted to withdraw contributed capital. Hedge fund management fees are typically 1-2\% of assets plus 20\% of realized profits.\textsuperscript{5} Lehmann (2006) argues that this compensation system is extremely important in aligning the incentives of managers with investors. Further alignment is assured because many advisers invest a substantial proportion of their own wealth in the fund.

\textsuperscript{3} In 2004, the SEC required that hedge fund advisers register as investment advisers but this regulation was invalidated by a federal court in June 2006 (Brown et al. (2006)). SEC (2003) describes which regulatory requirements do – and do not – apply to hedge funds.

\textsuperscript{4} Almazan et al. (2004) document a number of other restrictions placed on mutual fund investment advisers, and find that these restrictions are more common in situations with weaker governance structures. They conclude that additional investment restrictions constitute part of the broader mechanism by which investors seek to align their interests with those of their investment managers.

\textsuperscript{5} In many agreements, profits must exceed a treasury rate or some high-water market before performance fees are earned.
Hedge funds follow a wide variety of investment strategies, broadly separated into three categories:

1. **Directional**, sub-divided into “long-short equity hedge,” “dedicated short bias,” “global macro,” “emerging markets,” and “managed futures.”

2. **Event Driven**, e.g. funds seeking arbitrage profits from mergers or distress situations.

3. **Market Neutral**, including “fixed income arbitrage,” “convertible bond arbitrage,” and “equity market neutral.”

The so-called “funds of funds” allocate their investors’ money into hedge funds pursuing one or more of the above strategies. Figure 3 plots the proportion of hedge fund assets under management in each of these strategic categories over the period 1990-2004. The Directional funds have fallen from 60% of AUM to 40%, while Market Neutral funds have more than doubled their share, from 6% to 16%. The Event Driven funds remained relatively flat, with 10 – 15% of AUM.

Figure 3: Hedge Fund Assets Under Management, by Investment Style

Source: Garbaravi ius and Dierick (2005). Proportions do not add to unity because “funds of funds” asset holdings are excluded.
Hedge funds often seek out high-volatility positions and trade frequently to manage their risk exposures. For example, hedge funds make an estimated 30% of all U.S. equity trades, but only 15% of U.S. fixed income trades (FSF (2007)). Within the fixed-income class, however, they concentrate in the riskiest securities. Hedge funds are involved in 45% of trades in emerging market bonds, 47% for distressed debt, 58% for credit derivatives, and 89% for convertible bonds. The funds’ taste for risk is further indicated by their holdings of high-risk assets: they own 51% of the nonaccrual loans originated by U.S. banks (Cole et al. (2007)), one-third of leveraged bank loans, and 66% of outstanding distressed debt (Kambhu (2006)).

Many hedge fund positions are taken in relatively illiquid securities. Their ability to take these positions is facilitated by various “lock in” periods, which limit their investors’ ability to withdraw capital. Funds vary widely in the particulars of their withdrawal constraints, which often differentiate between contributed capital (which has a lock-in period) and earned capital (which can be withdrawn at the end of the month or quarter). Even when an investor’s capital is not subject to a lock-in period, most funds require 30 to 90 days advance notice before capital can be withdrawn.

B. The Prime Brokers

The hedge fund industry is closely intertwined with a relatively small number of prime broker-dealers, which provide many key services. As illustrated in Table 1, traditional investment banks head the list (Morgan Stanley, Bear Stearns, and Goldman Sachs), while the second echelon includes several prominent commercial banking firms (Citigroup, ABN Amro, Bank of American, and JPMorgan Chase). The range of prime broker services is summarized in Table 2. The prime broker starts by assisting with the hedge fund’s legal and operational setup, and then provides transactions, reporting, auditing, and valuation services. A recent SEC study explains how prime brokers are used: Less established hedge funds tend to have arrangements with a single prime broker, which is often the firm that assisted in the hedge fund’s start-up. More established hedge funds and those with more complex investment strategies are more likely to use multiple prime brokers. Hedge fund advisers may also use multiple broker-dealers in order to ensure only limited exposure of their investment strategies and portfolio holdings to any one broker-dealer. (fn 185, page 53)

The hedge funds’ propensity to trade makes them valuable customers.
Not only does the prime broker earn commission income, but he also acquires a counterparty that provides liquidity in most situations. One estimate put 2006 hedge fund revenues at 15-20% of investment banking revenues, with most of it accruing outside the prime broker relationship (Financial Stability Forum (2007)).

C. Hedge Fund Effects on Financial Markets

Hedge funds perform a specialized role in the capital markets: taking risks that are too extreme or too poorly understood for other investors. Because markets are generally quite efficient, identifying expected profit opportunities is expensive. The investment advisers hire extremely talented individuals and utilize the very best technology and data processing systems. In order to make a profit above those substantial costs, the fund must regularly identify mispriced situations, and then take large positions. Leverage is sometimes used to magnify expected returns. Risky, levered positions are not unique to hedge funds. Many money-center banks operate proprietary trading desks with similar investment strategies. The hedge fund innovation was to move that trading strategy outside a formal organization, and to raise funds from “outside” investors. A hedge fund’s unusual capital structure permits it to wait patiently for price anomalies to reverse themselves.

Kambhu (2006) provides a clear example of how a hedge fund aims to make positive returns and how it affects market prices in the process. He specifically discusses a so-called “convergence trade” based on the spread between Treasury rates and swap market rates. The profitability of a convergence trade depends on some type of market imperfection(s), which permits temporary demand fluctuations to affect the rate spread. If the swap rate is relatively high, the hedge fund buys the fixed side of an interest rate swap and sells short treasury securities. This transaction by itself tends to push the spread back toward its “normal” level. Regardless of which way overall interest rates move, this position can be closed out at a profit provided the spread converges back to its “normal” level. Levering this spread position increases its expected profits. Benefits accrue to other traders from the hedge fund’s

6 Suppose both rates fall, but the swap rate falls by more to close the spread. The initial swap can be closed out (offset) by sale of a similar swap at the lower fixed rate. The fund must repurchase a more-expensive treasury security to close its short position, but the loss on this leg of the transaction will be smaller than the gain on the other leg if the spread has narrowed.
spread trades:
The use of swaps by market participants to meet their hedging objectives depends on a stable relationship between the interest rate swap rate and other interest rates; convergence trading activity that stabilizes the swap spread therefore can have wide-ranging benefits to the economy. (page 2, emphasis added)

I return to this example in the following section to illustrate how failed convergence trades can generate “excess” volatility in the affected securities’ prices.

The Bank for International Settlements’ credits hedge funds with improving the market for credit default swaps (CDS). Their willingness to write such swaps permits lenders to protect themselves against default risk. With lower retained risk, lenders can expand their loan books.\(^7\) The hedge fund’s interest in buying the lower (equity) tranches in LDOs has also facilitated the securitization of credit in the U.S. – for good or ill. Similarly, their willingness to buy “catastrophe” bonds issued by insurance companies has substituted for a loss of reinsurance capacity that would otherwise have driven insurance premia higher.

Convergence trades, credit default swaps, and risk transfer arrangements facilitate innovation and efficiency in financial markets. Nearly all observers agree that hedge funds add liquidity and risk-bearing capacity which, at least under “normal” circumstances, improves market conditions for all traders.\(^8\) But what about unusual market circumstances? Garbaravi ius and Dierick (2005) summarize the standard view:

> Under normal conditions, hedge funds contribute to the liquidity and efficient functioning of financial markets. However, in certain cases, especially in small or medium-sized markets, their actions can be destabilising. (page 43)

### 3. Policy Issues/Questions

Official discussions of hedge fund actions generally express concerns about two things: investor protection and the potential for hedge fund trading to de-stabilize financial markets.

In the United States, the SEC protects investors by mandating disclosure of strategies and portfolio holdings for investment (mutual

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\(^7\) The Bank for International Settlements (2007) asserts that: Hedge funds have become key suppliers of liquidity in these markets through active trading, while their willingness to take on risk has supported the hedging operations of those institutions that are more focused on originating and servicing the underlying assets. (page 123)
fund) advisers that wish to sell directly to the public. An exemption has always existed for firms wishing to deal with “qualified investors,” who are presumed to be sufficiently informed to protect themselves. In the 1980s, the SEC defined a qualified investor as one who reports annual income in excess of USD200,000 and assets above USD1 million. Such individuals are permitted to deal with sellers of unregistered investments after warranting that they understand the risks of hedge fund investments and can afford the potential losses. One might question whether these thresholds are sufficiently restrictive (although the EU’s thresholds are lower), and perhaps investors should be required to demonstrate their financial sophistication more formally. But these issues lie beyond the scope of narrow economic analysis (and of this paper).

It is important to limit hedge fund participation to “qualified” investors so that the potential investment losses are concentrated among a group that can absorb them with relative ease. For example, a USD100 billion loss to bank depositors would cripple a banking system, because depositors expect safe returns. In the stock market, however, a similar loss does not disturb institutional arrangements because investors accept such losses as part of the usual risk-return tradeoff. Indeed, during the past 5 years the U.S. stock market has experienced one-day losses exceeding USD100 billion 167 times – approximately 13.3% of all trading days. The point is that large losses per se do not threaten the financial system. Large losses within the hedge fund industry are unlikely to cause widespread financial distress per se. Yet the funds’ use of high leverage and short sales presents a danger flag for many observers because these two techniques have been associated with price instability since (at least) 1929. If hedge funds were forced to unwind their (relatively illiquid) positions quickly, it is feared that extreme price movements might harm other participants in worldwide financial markets.

The potential for hedge funds to impair the financial system operates through two main channels. First, the banks serving as prime brokers might suffer losses on the loans that help to finance hedge fund positions. Large losses could compromise the brokers’ ability to conduct

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9 In December 2006, the SEC proposed raising the wealth limit to $2.5 million beyond the value of the investor’s home. As of July 2007, this rule had not been adopted.
10 As a rule of thumb, one point in the Wilshire 5000 index corresponds to one billion USD of equity market value.
other aspects of their businesses, such as securities underwriting or lending. This, in turn, could adversely affect real economic activities. Second, speculative positions might be unwound quickly if the market moves against the hedge funds, accelerating and exacerbating the resulting price changes. Other investors with similar positions would also suffer. More importantly, excess price fluctuations may distort the effects of hedge transactions put on by risk-averse traders. I’ll discuss these two channels of influence separately.

Most broker-dealer (bank) loans to hedge fund are secured by specific security transactions (Cole et al. (2007), pages 13-14). Initial and variation margin requirements are imposed by the lender, reflecting his assessment of the position’s volatility. The banks’ credit losses should thus be limited by the presence of collateral (margin). Kambhu et al. (2007) point out that competition for hedge funds’ (profitable) business might impair a broker’s risk management judgments, so that these margin positions become inadequate. Bankers’ profits should not be threatened by this competition because the higher expected losses resulting from lower margins should be no larger than the profits earned elsewhere in the hedge fund relationship. Indeed, recent estimates put the potential credit risk exposure of prime brokers to hedge funds at a few percent of the brokers’ total capital. Ferguson and Laster (2007, page 51) report that “In the wake of LTCM, the Basle Committee found that the potential to disrupt markets indirectly was of greater concern than the possibility of having a direct impact on financial institutions.” See also Kambhu (2006, page 12) and Ryback (2007, page 146).

11 It seems clear that such price fluctuations need not be confined to the relatively illiquid assets in hedge fund portfolios. Rather, if those positions fall in value and the funds need cash (e.g. to post additional margin), they may be forced to sell other, more marketable positions. This tends to make security returns more correlated across traditional market boundaries.

12 Margin requirements depend to some extent on a fund’s overall position, which may seem riskier than it really is if the fund employs multiple prime brokers in order to keep its positions confidential.

13 The Financial Stability Forum (2007) reports that

Initial margin requirements are under competitive pressure. In some cases, core firms are offering large hedge funds the ability to engage in some repurchase and OTC derivatives transactions without requiring initial margin. Any uncollateralized potential exposure resulting from the absence of initial margins is charged against the counterparty’s internally monitored credit limit. (page 14).

14 This position contrasts with Tsatsaronis’ (2000) assertion that “the main channel through which a fund’s difficulties may be transmitted more widely: its effect on creditors.” (page 68).
short, the direct credit losses from lending to hedge funds do not appear to be a major threat to financial stability.

The second (indirect) avenue by which hedge funds might endanger other financial players occurs through the potential effect of hedge fund leverage and short sales on price volatility. The potential for excess volatility resulting from hedge fund investments is readily illustrated with the convergence trade presented by Kambhu (2006) and summarized in the preceding section. (See also Brunnermeier and Pedersen (2006)). To profit from an expected decline in the spread between swap and Treasury rates, the hedge fund has bought swaps and sold Treasuries short. If the spread widens, this position loses money and the fund may need to post additional margin. If the fund is not “fully levered” the margin is easily posted. If the fund wishes to maintain its spread position it simply pledges some unencumbered assets as security for the loans associated with the spread transaction.

However, the example of LTCM indicates that a fund can lose enough value that all of its assets are already pledged as collateral against some loan. A further loss requires that some asset be liquidated in order to reduce the fund’s aggregate margin requirement. A narrow view suggests that the losing asset will be the one sold; the fund will reverse some of its bet that spreads will narrow by selling a swap and purchasing Treasuries. This transaction itself tends to widen the spread just after it has already widened on its own. It therefore seems possible that some initial losses on a convergence trade could generate further trades that worsen those losses by driving the spread still further away from “normal.” Exacerbating price changes, particularly in a losing direction, must be counted as one potential cost of hedge fund type trades (Xiong (2001)).

Of course, the fund need not sell securities related to its convergence trade when the swap spread moves against it (Kyle and Xiong (2001)). If it continues to believe that the swap spread will eventually narrow, it may choose to sell other assets to meet margin calls on its spread position. More generally, if the affected positions are illiquid the fund may choose to sell its more liquid assets to meet the margin call. Any such sale tends to depress the sold asset’s price. Hence one (potentially

15 This possibility could be exacerbated by low margins, even if the lenders themselves earn sufficient expected returns across the entire hedge fund relationship.
16 The wider spread could also lead some funds to re-consider their forecast that the spread would return to normal.
problematic) feature of hedge funds pursuing multiple strategies is that cross-market returns may be more highly correlated when one (illiquid) market starts to deteriorate.

Note that a return spiral will follow initial margin calls only if some large fund(s) is fully levered. In fact, most hedge funds do not operate with extreme leverage – at least, not when things are going well for them. Van Hedge Fund Advisors estimated that “20% of hedge funds used no leverage while 50% used leverage (borrowed money) of less than 1-to-1 (including short positions as leverage).” (Ferguson and Laster (2007), page 52). Garbaravius and Dierick (2005) report

In the TASS database, about one-third of single hedge funds provide information on average and maximum leverage (as specified in offering documents or voluntarily set by managers). Of those, about 10% have a ratio of average to maximum leverage in excess of 0.9. (page 45)

In other words, nearly all hedge funds operate with average leverage below 90% of their maximum. Indeed, operating without a capital cushion would reflect quite poor risk management, precisely because it might force the fund to sell desirable positions into a falling market. (Shleifer and Vishny (1997) model this possibility with great insight.)

The LTCM example again bears on this analysis. They started out well capitalized, but losses accumulated to leave them with little equity and the need to sell assets to cover margin calls. Even if several important hedge funds found themselves in this situation, a downward price spiral can be avoided if other investors (hedge funds) have equity available and will purchase the sold assets with only a limited price decline. Forced asset sales can provide attractive buying opportunities. Amaranth sold its energy book to Citadel and JP Morgan in late 2006; within a few weeks the buyers had substantially closed out the positions for a profit. When Bear Stearns encountered large losses in its mortgage-related securities in 2007, Citadel again purchased the portfolios in order to liquidate them in an orderly manner – that is, in a way that minimized the impact of liquidation on market prices. After Goldman Sachs’ Global Equity Opportunities fund lost 28% of its value in a single month during the summer of 2007, the investment bank and a group

17 A Financial Services Agency survey of London prime brokers found an average hedge fund ratio of assets-to-equity of about 2.4 (Ferguson and Laster (2007, p. 46)).
of individual investors contributed USD3 billion to the fund, to assure that it had the resources to take full advantage of “good investment opportunities.”

This discussion of selling pressure explains why observers track hedge fund leverage so keenly to identify the potential for downward spirals in certain markets. Yet on-book leverage provides a very noisy indicator of potential selling pressure. Consider the difference between a long stock position and an option on the same stock. An investor with $100 of equity could borrow another $100 to hold a margined position in stock. A second investor with $100 of equity could obtain the same exposure by purchasing an option on that stock whose delta is one-half. The option position requires no borrowed funds. Despite the difference in on-book leverage, these institutions have the same risk. Without understanding the assets held in portfolio, it is therefore impossible to know how much risk is associated with an observed amount of leverage.

Hedge funds are famously secretive and opaque, and these characteristics may also contribute to market fragility. Investors and lenders collectively may understand the total amount of risk in the financial system, but they may not be confident about the ultimate bearers of that risk. Such uncertainty makes it much more difficult for lenders to extend credit to new customers on short notice. This can compromise private credit allocations and tempt regulators or central bankers to enter the market as direct lenders.

4. Hedge Funds and Emerging Economies

At the end of 2006, the TASS database lists approximately 200 hedge funds claiming some type of “emerging markets” strategy. They control an estimated USD49 billion of assets in these markets and appear to be a major, and growing, source of external capital funds. Figure 4 provides some historical perspective. Emerging market funds had by far their greatest importance within the hedge fund industry between 1994 and 1997.

18 The BIS (2007, page 48) reports that “Large funds and institutional investors from developed markets, as well as hedge funds, account for the bulk of gross portfolio inflows into emerging market economies.” (emphasis added).
The hedge funds’ ability to control large portfolios via levered investments raises the possibility of market manipulation. Although such manipulation might occur in any security market, the concern is greater for relatively small markets with few large, informed investors. This fear has previously focused on exchange rate fluctuations.

When the British pound was driven out of the ERM in 1992, George Soros’ Quantum Fund held a USD10 billion short position in sterling. “Speculative attacks” were alleged again in 1997 when Asian currencies depreciated so rapidly. Eichengreen et al. (1998) expressed doubt that hedge funds had been at the leading edge of the 1997 developments.

A few years later, Fung et al. (2000) examined the pattern of hedge fund returns during those events, and concluded that other investors’ pursuit of the carry trade generated most of the pressure on the Thai bhat.¹⁹

Following the Asian crisis many countries let their exchange rates float, which substantially increases the risk of taking large positions in a currency. When a government is trying to maintain a fixed exchange rate, speculators have little risk of loss and large potential gain. Figure

¹⁹ Those other investors included proprietary bank trading desks, which reinforces the general point that the absence of hedge funds does not imply the absence of trades that might affect prices or volatility.
4 indicates that emerging market hedge funds lost market share after 1997.

Hedge funds can play a positive role in emerging market economies, which many investors consider too complex or illiquid to be attractive. Indeed, a long stream of finance literature documents how international differences in shareholder and creditor rights affect the form of financial contracts (LaPorta et al. (2002)). Effective investment in emerging markets therefore requires specialized local knowledge and the ability to ride out periods of substantial illiquidity. Both market conditions tend to raise the cost of capital for emerging market firms. However, this situation seems perfectly suited to hedge funds, which specialize in holding assets that are difficult to understand and are therefore illiquid. The presence of hedge fund investors in an emerging market should encourage others to invest as well because hedge fund actions tend to limit random price fluctuations. Furthermore, hedge funds may accept (insure against) certain risks that are large relative to the emerging market economy, freeing domestic investors to absorb local risks. On net, hedge funds’ willingness to hold emerging markets’ obligations seems likely to improve the functioning of those markets.

5. Summary and Conclusions

Hedge funds represent an innovative and exciting investment vehicle, available to sophisticated investors in most countries around the world. Their relatively undiversified positions in risky, illiquid securities have realized some impressive returns, which have attracted investors and investment capital rapidly during the past five years. Observers generally agree that hedge funds improve liquidity, risk-bearing, and price efficiency in normal times. The effect of hedge fund trading behavior during abnormal times raises some weighty questions. The most substantial dangers from hedge funds do not derive from the potential for large losses to fund owners. Rather, the danger lies in the funds’ potential effects on asset price volatility. Under certain conditions, asset sales to meet margin calls could cause prices to spiral away from “fundamental values.” But these conditions are pretty extreme, and the hedge funds themselves hold capital (“dry powder”) to protect against the need to sell securities into a falling market.

Whether or not policy makers believe that hedge funds are net
positive forces, curtailing their activities would require draconian restrictions, which that would impose large inefficiencies on markets and investors. Hedge funds are organized as private entities because they wish to avoid taxation and close scrutiny of their (proprietary) investment strategies. These investors can operate effectively from a variety of tax havens. They can, and will, move their activities offshore if a government tries to control them. Consequently, policymakers’ should seek to understand and monitor hedge fund activities, so they can act to stabilize markets if required to do so.
References


Banque de France, Financial Stability Review (Special Issue: Hedge Funds), April 2007.


Table 1: Selected prime brokers number of hedge fund customers (sorted by the associated funds’ total capital under management)

<table>
<thead>
<tr>
<th>Prime Broker</th>
<th>Number of Hedge Fund Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan Stanley</td>
<td>398</td>
</tr>
<tr>
<td>Bear Stearns</td>
<td>299</td>
</tr>
<tr>
<td>Goldman Sachs</td>
<td>341</td>
</tr>
<tr>
<td>Citigroup</td>
<td>69</td>
</tr>
<tr>
<td>ABNAMRO</td>
<td>72</td>
</tr>
<tr>
<td>Lehman Brothers</td>
<td>60</td>
</tr>
<tr>
<td>Merrill Lynch</td>
<td>39</td>
</tr>
<tr>
<td>Deutsche Bank</td>
<td>67</td>
</tr>
<tr>
<td>UBS</td>
<td>98</td>
</tr>
<tr>
<td>Banc of America</td>
<td>128</td>
</tr>
<tr>
<td>MAN Group</td>
<td>54</td>
</tr>
<tr>
<td>Credit Agricole</td>
<td>34</td>
</tr>
<tr>
<td>CSFB</td>
<td>53</td>
</tr>
<tr>
<td>JPMorgan Chase</td>
<td>11</td>
</tr>
<tr>
<td>Refco</td>
<td>27</td>
</tr>
<tr>
<td>Barclays</td>
<td>7</td>
</tr>
<tr>
<td>SEB</td>
<td>4</td>
</tr>
<tr>
<td>Banque Populaire</td>
<td>7</td>
</tr>
<tr>
<td>HSBC</td>
<td>15</td>
</tr>
<tr>
<td>NCB</td>
<td>7</td>
</tr>
<tr>
<td>KBC</td>
<td>6</td>
</tr>
<tr>
<td>AIG</td>
<td>5</td>
</tr>
<tr>
<td>Bank of Ireland</td>
<td>10</td>
</tr>
<tr>
<td>Societe Generale</td>
<td>37</td>
</tr>
<tr>
<td>ING</td>
<td>14</td>
</tr>
<tr>
<td>All Selected prime brokers</td>
<td>1,862</td>
</tr>
<tr>
<td>Others (including undisclosed)</td>
<td>1,402</td>
</tr>
<tr>
<td><strong>Total number of hedge funds in the database</strong></td>
<td><strong>3,264</strong></td>
</tr>
</tbody>
</table>

Source: Garbaravi ius and Dierick (2005)
Table 2: Services provided by prime brokers to hedge funds (Descriptions quoted or paraphrased from source: SEC Study, pages 53-4).

1. **Streamlined Trading.** The hedge fund maintains its funds and securities in an account with the prime broker. ... Transactions placed with executing brokers are effected through accounts with those brokers in the name of the prime broker for the benefit of the hedge fund. ... the prime broker, who clears the trade and provides custody of the securities.

2. **Securities Lending.** Prime brokers use their relationships in the banking and brokerage communities to locate and acquire securities to lend to their hedge fund customers for short selling purposes.

3. **Margin Lending.** Prime brokers are generally required to maintain collateral to secure margin loans to hedge funds as a result of regulatory requirements and internal limits on risk exposure, which are constantly monitored for changes.

4. **Capital Introduction.** Introduce hedge fund advisers to potential hedge fund investors.

5. **Hedge Fund Start-up Services.** Introductions or referrals to lawyers, accountants and other service providers. In addition to assisting these hedge fund advisers with back office support, the broker-dealer may provide the hedge fund adviser with office space.

6. **Customized Reporting.** E.g. (1) end of day pricing of securities; (2) risk management information for investment advisers; and (3) reports that allow fund advisers to provide investors with some limited transparency information.

7. **Research.** Most broker-dealers offer to provide proprietary and third-party research and other soft dollar arrangements related to individual securities and particular market sectors of interest to the hedge fund's investment adviser.

8. **Valuation.** Price estimates for certain types of (or individual) securities.
9. **Technology.** Facilitate the start-up of new hedge funds by offering or recommending providers of reporting systems, software, trading systems, connections to ECNs, fixed connectivity and risk management systems.

10. **Operations Services.** (1) advice regarding minimum and maximum amounts of investor subscriptions required to be raised and rates of returns expected by investors; (2) preparation of offering materials and reports to investors; (3) information on strategies to assist in obtaining investments; (4) advice as to appropriate investment alternatives for excess cash; and (5) referrals of requests for information from potential investors.
In this most recent work, Professor Flannery provides a broad overview of the activities of hedge funds and of their role in world markets. The paper presents a balance of issues, focusing not only on hedge funds’ perceived ability to exert a destabilizing force through their speculative activities – an issue that has been part of the policy debate of late – but also on the positive side through their provision of market liquidity, risk sharing opportunities, and helping to improve the accuracy of market prices.

There is an implicit question in this work in that, given both the positive as well as the negatives sides of hedge funds’ activities, it is not obvious how these institutions should be regulated, and even whether they should be regulated at all. The argument in favor of regulation focuses on their tremendous growth, an aspect documented in this paper. This growth has been not just in terms of the number of funds, but also in terms of the assets under management (AUM) for hedge funds. For instance, this can be clearly seen in the following figure, taken from Cole, Feldberg, and Lynch (2007).
It is clear from the figure that the growth in hedge funds has been astronomical, and has accelerated in recent years. Focusing on this data, one is tempted to say that this growing market must be regulated in order to protect investors.

On the other hand, a slightly different picture is painted when one focuses on hedge fund assets as a percentage of global debt and equity instruments outstanding. As the figure below makes clear (figure is taken from Ferguson and Laster, 2007), as a percentage of global assets hedge fund holdings are actually not very large, not having exceeded 2% of the total value of these instruments outstanding. From this perspective, hedge funds are an important but perhaps small part of the global market, with most of the assets held by so-called “qualified” investors who are supposed to have both the expertise for understanding the risks involved, as well as the wealth to tolerate a certain amount of risk in their portfolios. As such, there may be no need to regulate these institutions, as that would likely only hamper their activities without offering additional protection – who is there to protect?

Hedge fund assets have been growing rapidly

A closer look at hedge fund portfolios

While the previous section offers a broad overview of hedge funds’ holdings, here we take a slightly more detailed look and focus on the possible risks associated with the growth of hedge funds.

One concern that has been raised recently in the financial press,
and documented in this paper, is that while hedge funds may only be a small part of the overall market, they may be “big” in particularly sensitive markets. These include the market for credit derivatives, such as credit default swaps, as well as the market for asset backed securities, including those backed by subprime mortgages. They also seem to have a fairly large presence in the trading of distressed debt. To the extent that these types of securities are riskier and more volatile, there is greater concerns of instability in hedge fund portfolios. Moreover, it appears that many of the counterparties in these transactions are commercial banks, creating concern that instabilities for hedge funds may translate into problems for these banks.

Different perspectives have been espoused concerning the trading of derivative securities. For instance, while chairman of the Board of Governors of the Federal Reserve, Alan Greenspan was quoted as saying, in reference to the increasing use of derivatives, “These increasingly complex financial instruments have especially contributed, particularly over the past couple of stressful years, to the development of a far more flexible, efficient and resilient financial system than existed just a quarter-century ago” (Washington Post, March 6, 2003). A very different perspective is offered by Warren Buffett, chairman of Berkshire Hataway, in a letter to shareholders (as quoted by the Washington Post, March 6, 2003): “Derivatives are financial weapons of mass destruction ... The dangers are now latent -- but they could be lethal.” These divergent statements echo the concerns that have recently been raised regarding the holdings of hedge funds and their counterparties in these transactions.

A somewhat different concern has been raised concerning the liquidity of hedge funds’ portfolios. While there is a fair amount of evidence suggesting that hedge funds tend to concentrate their holdings in assets that are relatively illiquid (see, e.g., Kambhu et al., 2007), there is also recent suggestions that the correlation of holdings across hedge funds may also be increasing. Increases of correlation in the holdings of assets that are already not very liquid can lead to ever greater redemption problems for these institutions.

A recent Wall Street Journal article (September 7, 2007) illustrates these concerns. The article documents the losses by one of Morgan Stanley’s funds, arguing that these added up to around $500 million over the two week period from the end of July to the beginning of August, 2007. What is particularly interesting from the article is the
claim that not only do the funds themselves not know what triggered
the losses, but that there is a widespread theory that “the proliferation
of quant funds holding a lot of the same positions may have been a
recipe for magnifying the losses.” On a related note, a recent study the
European Central Bank (2006) finds that correlations in hedge fund
returns has increased somewhat in the 8 year period since Long Term

These issues all raise the question of the possible exposure of the
financial system to the risks taken – and borne – by hedge funds. Banks
exposure to hedge funds seems to be increasing. While this exposure is
not enormous, there is much literature about how even small shocks
can be greatly amplified through the financial sector. For instance, the
“financial accelerator” models of Bernanke and Gertler (1989) suggest
falls in collateral value can make it difficult for borrowers to tap into
other sources of credit when their primary bank is forced to reduce
lending. This amplifies the size of the initial shock and causes it to
propagate throughout the economy, leading to broader macroeconomic
consequences.

Some suggestions for future research

Flannery (2007) argues that even if hedge funds were absent,
other institutions would trade in a similar fashion. In other words,
while important, hedge funds are merely displacing other firms rather
than adding a new element to volume (and hence possibly volatility).
For instance, it seems that the trading desks of investment banks have
been losing market share to hedge funds in the market for fixed income
arbitrage. One question that naturally arises is whether anyone really
knows what has been the aggregate effect of the growth of hedge funds.
Has there been an aggregate increase in overall trading beyond past
trends? Have hedge funds merely displaced existing institutions, or
have they expanded way beyond what these institutions were likely to
do? To what extent have issuers, such as corporations, responded to the
increased demand for securities by issuing them in greater amounts?

A somewhat related question worth studying in future work is
to look more closely at the time series evidence of hedge fund presence
in the trading of the riskiest securities. While recent evidence suggests
that hedge funds are fairly big players in these markets, do we know
whether they are becoming more and more specialized? At the same time, are they becoming less and less diversified? For example, with the well-documented recent collapse of the sub-prime ABS market, what do we know about how much is held and/or traded by hedge funds? Is this possibly growing trend to hold riskier, more opaque securities a growing cause for concern?

Concluding comments

Mark Flannery’s paper provides a great platform for discussion, as it highlights both the possible dangers associated with hedge fund activities as well as the positive role they can play. Perhaps in the end what comes out of this document is a better understanding that we in fact have little understanding of these institutions and of the positions they hold. But Mark’s work also suggests that we are learning and that there is much more work to be done to better understand what risk the growth of these institutions poses. In all, this makes for a very interesting read and for a well-thought out research project.
References


Comments and Observations on the Paper by Mark Flannery The Role of Hedge Funds in World Capital Market

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Co-editor, Journal of Financial Services and Research

Introduction

In the pursuit of private profits, hedge fund managers and investors generate both public spillover benefits and public spillover costs. The social benefits occur because of the high volume of trading done by hedge funds, which provides increased liquidity in the financial markets such as credit default swaps or catastrophe bonds; liquidity in these markets increases the ability of third-party firms to use these financial contracts as risk-mitigation tools. The social costs occur because of the degree and type of financial leverage often used by hedge funds as part of their investment strategies; high amounts of short-maturity leverage can force hedge funds to wind down large, unprofitable positions quickly, resulting in fire sales that can potentially destabilize financial markets.

In his essay, “The Role of Hedge Funds in World Capital Markets,” Mark Flannery describes what hedge funds are, how hedge funds work, and why, in some states of nature, hedge funds may introduce large amounts of instability into financial markets. Hedge funds are among the least regulated financial institutions in developed economies, and as such, the net social benefit from hedge funds is market-driven. Is this outcome optimal for society? Or could we improve social outcomes by interfering with this marketplace—that is, would the benefits from increased regulation of hedge funds exceed the deadweight costs created by regulation? This short note is a thought experiment about how imposing various “generic financial regulations” on hedge funds might affect, for good and for bad, the efficiency and stability of financial markets.
Industry Definition

In order to regulate an industry, one first has to define the industry. This is no trivial issue. There is no standard working definition of a hedge fund, and more importantly for our purposes, there is no legal or regulatory definition of which I am aware. However, as Mark points out in his essay, hedge funds do share some broad characteristics with each other. For example, hedge funds are organized as partnerships comprised of a small number of qualified (i.e., wealthy) investors. Once invested, these investors usually have limited access to their funds. And hedge fund managers typically pursue non-diversified investment strategies which are not disclosed to the public, and which are amplified by a large degree of financial leverage.

Are these few parameters enough to establish a workable legal definition of a hedge fund—on which we could write regulations that apply strictly to the social spillover costs generated by hedge funds—but would not ensnare, say, private equity funds, REITS, or other investment vehicles? For now, let’s simply assume that we do have a workable legal definition of a hedge fund, and return to this problem of industry definition on another day.

Three generic regulatory policies

I am generally loath to advocate new regulations on financial markets or institutions, so the reader should remember that this is a thought experiment, undertaken on the grounds of intellectual curiosity. Let’s consider three generic financial regulatory approaches that have been used with some success to enhance the safety and soundness of financial institutions in market economies: transparency so that markets can better monitor and discipline the financial institution in question; diversification so that poor returns from one investment are buffered by good returns from other investments; and leverage limits so that losses on less diversifiable investments can be absorbed without resulting in insolvency. And here is the though experiment: Are any of these generic regulatory approaches appropriate for hedge funds? And if so, how would applying these regulations affect the public spillover costs and benefits generated by hedge funds?
Transparency

Imposing greater transparency on hedge funds—say, by requiring hedge funds to reveal their on- and off-balance sheet positions—is a non-starter. Hedge funds keep their trading strategies secret for a good reason: Once an investment manager finds a profitable trading strategy, she wants to exploit it for the benefit of her investors and her own professional reputation. If her trading strategy was made public, entry by other investment managers would likely eliminate the market inefficiencies (pricing errors) upon which the trading strategy is based. Thus, transparency-based policies would eliminate or substantially limit the incentives for investment managers to search for profitable trading opportunities, which would in turn reduce overall hedge fund activity and with it the positive spillover benefits (i.e., increased liquidity in financial markets) currently being generated by hedge funds.

Diversification

Most hedge funds have a single investment strategy, which is not surprising: How many profitable investment ideas can we expect one investment manager to dream up? As a result, individual hedge funds are extremely undiversified. However, there is substantial diversification across the population of hedge funds. One way to reduce the spillover (financial instability) costs generated by individual hedge funds is to harness this industry-level diversification. When one hedge fund is under pressure to quickly unwind a large position, a fire sale could be avoided if each of the other hedge funds (which are presumably not under pressure, because they have different trading strategies) stood ready to purchase a small amount of the assets being sold.

To avoid coordination and free-rider problems among hedge funds, one could harness the cross-sectional diversification by creating a liquidity fund. Each hedge fund would contribute to the fund—use your own favorite tax scheme—and the fund would stand ready as an emergency counter-party to help contributing hedge fund unwind and avoid a fire sale. The securities purchased by the fund could be sold off gradually in the future, avoiding large price fluctuations and financial market instability. Thus, a liquidity fund formalizes and systematizes Mark’s following statement: “[A] downward price spiral can be avoided if
other investors have equity available and will purchase the sold assets with only a limited price decline.”

Of course, there are a number of related problems that would have to be addressed to make this policy a workable one. For example, in the absence of a functioning market, some mechanism would be needed to determine the asset prices. And the very existence of the liquidity fund could create moral hazard incentives, encouraging hedge fund managers to lever-up and take even greater risk. Regarding these two problems, one should note that the objective is to maintain the liquidity and stability of financial markets, not the solvency of troubled hedge funds. Choosing asset prices that impose some losses on the troubled hedge fund, and establishing a credible policy of letting equity holders go bust, will greatly defuse the moral hazard problem.

Also, one should note that a liquidity fund would institutionalize the ad hoc actions taken by individuals and institutions to provide market liquidity in the past—for example, the quelling of the 1907 banking panic by J.P. Morgan (the man, not the firm), the temporary rescue of LTCM coordinated by the Federal Reserve in 1998, and the current efforts of the U.S. Treasury to encourage private firms to stabilize the asset-backed commercial paper market.

Leverage limits

I was struck by the following statement in Mark’s essay: “Because markets are generally quite efficient, identifying expected profit opportunities is expensive.” At first, this seems like a truism that does not even need to be stated. But upon further consideration, I now realize that this is a very powerful statement that, at its core, allows us to explain why hedge funds use so much financial leverage. To illustrate this realization, I will use the famous (to economists) story about the $20 bill lying on the street...

A labor economist and a financial economist are walking down the street, when the labor economist sees a $20 bill lying on the opposite sidewalk. The labor economist says “let’s go over there and pick up that $20 bill, and donate it to a good charitable cause.” The financial economist replies “Don’t bother. There is no $20 bill on the sidewalk.” The labor economist, befuddled, says “Of course it is there. I can see it with my own eyes!” To which the financial economist finally says “The $20 bill can’t possibly be lying on the sidewalk. If it were, someone
would have already picked it up.”

Now, this story works only because the currency in question was a $20 bill—that is, a large enough prize to be worth the effort of crossing a busy street. The story makes no sense for a dime or a penny. We walk right past pennies all the time without picking them up....that is, unless we are a hedge fund, in which case we are willing to pick up a penny as long as we have enough leverage finance to make it a profitable endeavor. High leverage is a key driver of hedge fund risk, and is perhaps the main underlying reason why a failed hedge fund investment strategy can destabilize markets. With little equity capital on hand, a fire sale creates losses large enough to bankrupt the hedge fund.

But let’s perform one last thought experiment: Imagine that a leverage limit is imposed on hedge funds. The leverage limit would be binding only for the “penny-picking” hedge funds, that is, for trading strategies generating such small margins that high financial leverage in necessary to deliver a reasonable return on investment. All else equal, these are the hedge funds most likely to have to unwind their positions quickly.

So arguably, a leverage limit would be welfare-enhancing, because it would eliminate hedge funds that generate only small amounts of market surplus and are most likely to destabilize financial markets. And this would not be a large percentage of hedge funds: Mark reports (from various sources) that less than one-in-ten hedge funds use 90% leverage finance. Mark also writes that “Indeed, operating without a capital cushion would reflect quite poor risk management.” If the highly leveraged funds are also the most poorly managed, as Mark suggests, a leverage limit would replicate an efficient asset allocation, without the collateral damage that can result from fire sales and liquidity crises.

A closing thought

I recognize that public policies that impose material costs on hedge funds—whether they be taxes that requires hedge funds to capitalize a liquidity fund, or constraints that require hedge funds to hold more equity capital—could be circumvented if hedge funds moved their operations out of the country imposing the regulatory costs. So full international cooperation is a necessary condition for either of these policy proposals. But that is a thought experiment for another day.
Abstract

The process of globalisation started in the 19th century. We have observed a significant change in the global economy since the Industrial Revolution. The Emergence of international institutions such as the UN, the IMF, the World Bank and the WTO have contributed to the process of globalisation in the 20th century. At the same time, it is important to consider the role of more effective international institutions in the 21st century. The process of regionalism has contributed to the process of globalisation, as we observe the way countries in Europe are working together with the EU or nations are trying to have more free trade and financial integration under APEC. At the same time, it is important to see effective national institutions in place which are committed ensuring that national policies will be well implemented with the view to ensuring that national and regional governments and institutions are also playing their role in the process of globalisation. Furthermore, individuals as national, as well as, world citizens should play their role in contributing to the effective process of globalisation in such a way that all people and nations could benefit from an increasingly integrated global economy.

JEL classification: G15; G25

Keywords: Globalisation, Economic Growth; Financial Integration
1. Introduction

It is the current process of globalisation that offers an opportunity to reflect on the evolution of civilisation that started from the small entity of family progressed to tribes, city states and nations over many thousands of years. Since the 15th century, the process of globalisation has gradually started, as people travelled across the new world. However, it was during the 19th century that social scientists considered the first wave of globalisation. It is now argued that the first wave of globalisation started in 1868 or 1870. Since then we have observed migration of workers from some parts of the world to new places such as the US and Australia. We have seen the First and Second World Wars and the emergence of international institutions such as the UN, the IMF, the World Bank and the WTO. At the same time, we have observed the emergence of regionalism in different parts of the world, particularly in Europe. Furthermore, the Asia Pacific Economic Cooperation (APEC) has the potential to accelerate the process of regional integration in the Asia Pacific region. It is also possible to see that regionalism may well lead to more effective globalism and the emergence of a more integrated global economy with effective international institutions. While there have been a few studies suggesting that globalisation has not contributed to economic growth, the recent study by Kose, Prasad, Rogoff and Wei (2006) provide good analysis of literature in this area and show that effective national institutions could increase economic growth and assist some nations to better integrate into the global economy.

The purpose of this paper is to review the process of globalization and look at the ways globalization has evolved and the way both developed and developing countries have reaped the benefits of globalization. The paper also considers how economic growth has been contributing to the process of globalization. To this end, section 2 reviews the process of globalization, section 3 discusses the trends in growth indicators and compares GDP with the Human Development Index (HDI) as a way of seeing the bigger picture of economic growth in different parts of the world; section 4 analyses some aspects of the benefits of financial globalization and section 5 concludes.
2. Globalisation

According to the IMF work by Masson (2001), globalisation can be defined as the increased integration of economies, reflected by increases in trade, capital, investment and migration flows. Although there are marked increases in living standards associated with globalisation, such gains are not equally distributed worldwide. The movement of capital, financial assets and financial corporations from their domestic country to the rest of the world has been part of what is referred to as financial globalisation. The process of financial globalisation has been associated with an increase in foreign assets and liabilities position.

The second wave of globalisation started after the Second World War around the early 1960s and we are still in the second wave.

The first wave of globalisation took place from 1870 to 1914. However, the First World War brought the first wave of globalisation to an end. Rajan and Zingales (2003) refer to this episode as the Great Reversal “period.

According to Masson (2001), the start of the 20th century saw rapid growth in world trade, attributable largely to falling transportation costs. Table 1 shows that between 1880 and 1910 the cost of ocean transport as a percentage of production costs for wheat fell by 13.5 per cent. Likewise, the cost of ocean freight fell by 35 per cent between 1920 and 1930.

Table 1 - Transport Costs, 1830 - 1990

<table>
<thead>
<tr>
<th>Year</th>
<th>Wheat, Percent of Production Costs</th>
<th>Ocean Freight 1920 = 100</th>
<th>Average Air Transportation Revenue per Passenger Mile (in 1990 US$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1830</td>
<td>79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1850</td>
<td>76</td>
<td></td>
<td></td>
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<tr>
<td>1880</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1910</td>
<td>27.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1920</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1930</td>
<td>65</td>
<td></td>
<td>0.68</td>
</tr>
<tr>
<td>1940</td>
<td>67</td>
<td></td>
<td>0.46</td>
</tr>
<tr>
<td>1950</td>
<td>38</td>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>1960</td>
<td>28</td>
<td></td>
<td>0.24</td>
</tr>
<tr>
<td>1970</td>
<td>29</td>
<td></td>
<td>0.16</td>
</tr>
<tr>
<td>1980</td>
<td>25</td>
<td></td>
<td>0.10</td>
</tr>
<tr>
<td>1990</td>
<td>30</td>
<td></td>
<td>0.11</td>
</tr>
</tbody>
</table>

Technological advances in communication have been at the forefront of further integrating economies throughout the world. As can be seen from Table 2, the price of a 3 minute telephone call from New York to London has dropped a staggering 99 per cent between 1960 and 2000. Likewise, the price of a computer has fallen by 99.9 per cent since 1960. Such technological changes have been significant in the process of globalisation in an increasingly interdependent world.

Table 2 - Communication and Computer Costs, 1960 - 2000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>60.42</td>
<td>1,869,004</td>
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<tr>
<td>1970</td>
<td>41.61</td>
<td>199,983</td>
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<tr>
<td>1980</td>
<td>6.32</td>
<td>27,938</td>
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<tr>
<td>1990</td>
<td>4.37</td>
<td>7,275</td>
</tr>
<tr>
<td>2000</td>
<td>0.40</td>
<td>1,000</td>
</tr>
</tbody>
</table>

Source: The same as Table 1.

With regard to the process of financial globalisation, the empirical results of the benefits of financial globalisation have been inconclusive. For instance, Parasad et al (2003) show that the current data cannot indicate that financial globalisation has contributed to stronger economic growth in developing countries and at the same time, some countries have experienced more financial volatility. At the same time, there are some studies like Bekaert, Harvey, and Lundblad (2005) who found a positive relationship between financial globalisation and economic growth. Furthermore, the latest work by the IMF (2006), by Kose, Prasad, Rogoff and Wei, indicate that financial globalisation has had positive effects on the fortunes of some developing countries. However, this positive effect has been achieved due to the improvement in the process of reforms in the national financial institutions.

3. Trends in Growth Indicators: GDI and HDI

In this section, the paper reviews and analyses some of the issues
with respect to the way economic growth has been measured in the past and the additional factors that should be put in place for more accurate measurement of economic growth. This paper adopts and also uses an IMF study by Craft (2000) in discussing historical trends in economic growth and issues related to growth and at the same time, uses more updated available data to further analyse some aspects of economic growth. Therefore, most part of this paper relies heavily on the work by Craft (2000) and uses the issues and concept developed in that paper. The rest of this section is mainly the summary of some aspect of Craft’s (2000) work.

Since World War II, trends in growth of real GDP per capita has become a key policy objective in virtually all countries, a notion predicated on the belief that government policy has a significant influence on long run growth outcomes. The key points which require concern and consideration relate to:

1. The relationship between economic growth and changes in living standards
2. The uneven pace and spread of economic growth between and within countries

The gap between rich and poor as measured in GDP terms has widened enormously since the late nineteenth century, representing a divergence between developed and developing nations. The levels of real GDP per person of many countries in 1990 were still much lower than those of leading countries in 1870. An average of $1336 GDP per capita for Africa in 1990 is still below the median of $1894 for countries in Western Europe, America and Oceania in 1870. This trend is further enunciated by the fact that 20.1 per cent of the non-American population in 1990 lived in countries where real GDP per capita as a proportion of the US level has fallen since 1950.

This apparent disparity in the levels of income is questioned by the emergence of alternative indicators of living standards other than GDP such as the Human Development Index (HDI). Such indicators have arisen from a growing acceptance that GDP growth is a limited, if not misleading, indicator of well being.

The HDI provides a broader indication of economic development, with its focus on the three main components of education, income and longevity. It offers an important perspective on changing living standards, alongside the narrow figures provided by GDP per capita.

We have been able to obtain the latest information about HDI and
compare it with the information reported in Craft (2000). As can be seen from Table A in the appendix to this paper, the HDI ranks are shown for the 2004 year. When this information is compared with the figures in Tables B and C that were originally reported by Craft (2000), one can see that there is clear evidence of progress since 1950 in the areas of literacy and life expectancy, particularly in developing countries. The HDI measure also shows much less divergence, partly because of its discounting of higher incomes and also because of its focus on social indicators such as mortality rates.

The HDI scores for all nations are well ahead of the 1870 scores for the leading countries of that time. Furthermore, there has been a significant fall in the gap between average HDI levels in Africa and those of the advanced countries of Western Europe, North America and Oceania from 0.608 to 0.391.

The speed of this transition has been notably higher in recent times, with the average HDI gain for countries in a state of low human development between 1950 and 1995 being 0.350 compared with 0.212 for the period between 1870 and 1913.

### 3.1 Twentieth Century GDP Growth

The data reported by the IMF, in the work by Craft (2000), highlight that twentieth century growth in GDP per capita has generally been much stronger than that prior to 1870. Regions such as India and Latin America have performed much better in the latter half of the twentieth century when compared with the U.K and U.S during the period 1820 to 1870, where 1.5 to 1.8 per cent was approximately the maximum growth rate bar a few exceptions. It is notable that such growth rates represented a vast improvement from the growth rates experienced during Industrial Revolution Britain, where long run growth of 0.2 per cent was a good result. When viewed in a modern context, this period of rapid industrialisation reaped relatively limited growth when compared to the growth rates in a twentieth century world, characterising the vastly different foundations that modern growth is predicated upon.

Despite overall acceleration in real GDP growth in the twentieth century, this trend has not been consistent between and within countries. During the first half of the twentieth century, the United States was by far the leader in real GDP per person relative to Europe and Asia. This was due greatly to their successful exploitation of natural resources,
coupled with technological growth and educational standards that surpassed other nations. Their dominance has been subdued during the latter half of the twentieth century with OECD and Tiger economies catching up despite the continuing divergence in wealth between the richest and poorest nations.

Post war Europe has also bridged the gap because the reduction in barriers allowed for emulation of US technology and large investments in human and physical capital laid the foundations for strong growth. In addition, advantages that the US had gained from cheap natural resources and a large domestic market in the early part of the twentieth century were reduced due to European integration and trade liberalisation.

Data reported in Craft (2000) show that the last quarter of the twentieth century has seen prolific growth experienced by East Asian economies, which have averaged 4.6 per cent growth between 1973 to 1996 compared with the United States 1.6 per cent. At the same time, it should be noted that advanced nations such as the UK had the highest real GDP per person in 1900 but was 13th in 1996, whereas Japan ranks 8th in 1996 compared to a dismal level in 1900.

3.2 Adjusted GDP as a Guide to Long Run Living Standards

The use of historical national accounts such as GDP growth as an absolute measure of living standards is too narrow to determine the progress of living standards. Numerous aspects of development such as mortality rates and labour inputs are not accounted for in the measure of growth in real GDP. It has been argued that it is both possible and desirable to include these components of well being into measures of economic growth.

The effect of incorporating improvements in mortality and hours worked per person substantially raises regular GDP growth rates. The trend since 1870 points to higher life expectancy and also to less hours worked per person, an important consideration for labour productivity. To illustrate, while the real GDP per capita in Latin America in 1996 of $5155 was less than 60 per cent ahead of the UK level in 1870, real output per hour worked was over three times that of the UK in the same period. Thus, growth in GDP per capita may tend to understate the extent of economic development in countries such as the Latin America in comparison to the UK.
Conversely, growth in terms of Net National Product (NNP) may also exaggerate growth in living standards in its neglect of factors such as environmental damage and depletion of non-renewable resources. Such factors may tend to overestimate the level of sustainable consumption in an economy. An empirical study reported by Craft (2000), suggests that depletion of non-renewable resources costs the world over 1 per cent of average consumption each year, a figure which necessitates a correction of NNP for capital depletion. This is also true of technological advancements, with the possibility of falling returns to R&D another reason to suppose that sustainable consumption has been growing at a slower rate than real GDP.

3.3 Sources of Economic Growth

The various measures of economic growth pose a potential problem in accurately presenting a measure of long run growth in the world economy. A useful technique, as reported in Craft (2000), is growth accounting, which attributes growth in terms of growth of factor and of total factor productivity (TFP). The basic formula used in growth accounting is as follows:

\[ \frac{\Delta Y}{Y} = \alpha \frac{\Delta K}{K} + \beta \frac{\Delta L}{L} + \frac{\Delta A}{A} \]

The growth rate of output (Y) is accounted for in terms of the contribution of the growth of the capital stock (\( \Delta K/K \)) times the elasticity of output with respect to capital (\( \alpha \)), the contribution of the growth of the labour force (\( \Delta L/L \)) time the elasticity of output with respect to labour (\( \beta \)) and growth of TFP (\( \Delta A/A \)).

A key issue is determining the extent to which TFP growth and other individual components affect overall economic growth.

Sources of growth

Table D reports the sources of growth over time for certain countries. The contribution of capital in the US and other countries has been much stronger in the times preceding the late twentieth century. This decline in capital’s contribution can be attributed to both rising capital to output ratios and falling shares of investment in GDP.

The contribution of labour inputs to growth has been the strongest in the US because of their high population growth. However,
it contributed less than 0.5 per cent per year in each period since 1913 and declining work hours in other OECD countries has significantly restrained the growth of labour inputs as a main source of economic growth.

The contribution from TFP growth, as Craft (2000) discussed, has been varied across and within nations. A broad summation of TFP growth is that it rose from the late nineteenth century through the Golden Age and then declined sharply in the recent growth slowdown. The effect of technological change on economic growth can be correlative with TFP growth. However, this assumption must be given weight to factors such as elasticity in the substitution between factors of production and economies of scales possibilities.

Rising TFP growth in the 1970’s correlates with spending on R&D and the US experience with TFP growth tends to suggest the link between it and the effect of technological change on growth. It is apparent that this link is not consistent however, as TFP growth understates the role of technology in the nineteenth century and overstates it in the mid twentieth century. This is a reflection on the switch between labour saving technological changes in the nineteenth century with the capital saving changes in the twentieth century.

A comparison of the effect of TFP growth for Africa and East Asia produces significantly different results. East Asia has been experiencing fast growth whilst growth failure in Africa has seen GDP per capita in the continent declining over the last quarter of a century.

Table D shows negative TFP growth for Africa in the period 1960-94. Investment in Africa has been held down by the high price of capital goods in protectionist economies whilst education levels have remained low.

Investment rates in East Asia have been high relative to historical norms and points to a strong contribution from capital towards growth. The stronger TFP growth in East Asia may reflect effectiveness in technology transfer which compares very favourably with other Third World experiences. However, when compared with European growth, East Asian growth has relied much more heavily on factor inputs, both labour and capital, and less on TFP growth than that of Golden Age West Germany.

The current data indicates that only a small number of developing countries have been participating in financial globalization. The data reported by the IMF indicate that developed countries have been the most significant beneficiaries of financial globalization, followed by certain emerging countries. According to Kose et al (2006) the recent data show that developed countries account for over 90 percent of the total outstanding foreign liabilities, only about 8 percent belongs to the emerging countries and the rest to other developing countries. Such data confirms the work by Obstfeld and Taylor (2004) regarding the patterns of financial globalization both in the 19th and then in the 20th century.

The capital is not flowing to many developing countries due to a number of challenges that need to be addressed both at the national and international levels, even if some of them have relatively good education and health indicators. This makes both national governments, international institutions as well as the international community accountable to ensure that the process of financial globalization will gradually become universal and all embracing.

In the meantime, it is worthy to consider the composition and nature of capital flows into developing countries. The current data from the IMF reported in Kose et al (2006) indicate that debt financing is on the decline. We are also observing that FDI now accounts for more than 50 percent of all capital inflows in the developing countries, followed by portfolio investment (12 percent).

Economic Growth

As discussed by Kose et al (2006), the relevant literature suggests that there is a positive relationship between economic growth and portfolio equity flows. At the same time, there is an argument that FDI accompanied by increase in trade could be beneficial. Furthermore, there is also an argument that there is a positive link between FDI and productivity.

However, as discussed by Kose et al (2006), the empirical work does not support conclusively that financial integration is contributing to faster economic growth. This is in the context that all variables for the growth factors have been controlled for. One should, however, note that there is also the problem of endogeneity between financial integration
and growth that remains problematic. At the same time, there is also the issue of how to lump together the countries, what methodology we should use, etc.

**Volatility**

Empirical results according to Kose et al (2006) do not support the fact that financial globalisation has reduced the global risk sharing. At the same time, there is not much evidence that financial globalisation has contributed to regional or financial crises.

**Co-movement**

The empirical results reported by Kose et al (2006) indicate that once financial and economic integration are well established, then we could see risk sharing benefits of financial integration. However, at the present time, without a proper system in place for the process of integration, there does not appear to be much co-movement amongst some countries.

Despite inconclusive empirical evidence of the direct role of financial globalisation on growth, empirical evidence shows that indirect effects of market liberalisation and deregulation of the national financial markets, reforms of the national institutions do positively contribute to faster and more sustained economic growth.

It appears that sound national institutions could be essential in ensuring the flows of foreign capital into countries. This in turn will increase the TFP (total factor productivity) which is one of the key contributors to the long term growth process. As could be seen from Table D in the appendix to this paper, for some countries TFP has been significant and yet it is the reforms of the national institutions, reduction in corruption, transparency of the system, sound macroeconomic policies and a well trained work force that could ensure an increase in the flow of foreign capital into developing countries. Figures A and B are an attempt to capture the process of globalisation and growth. It should also be noted that without a proper threshold where certain infrastructure and national reforms have been put in place, financial and economic liberalisation may lead to more challenges such as volatility and sometime financial crisis.
Figure A
Two Views of Impact of Financial Globalization on Developing Countries...

The Traditional View

Financial Globalization

More efficient international allocation of capital
Capital deepening
International risk-sharing

GDP growth
Consumption volatility

The traditional view focuses on the importance of channels through which capital flows could directly increase GDP growth and reduce consumption volatility.

A Different Perspective

Traditional Channels

Financial Globalization

Potential Collateral Benefits

Financial market development
Institutional development
Better governance
Macroeconomic discipline

GDP / TFP growth
Consumption volatility

Our perspective acknowledges the relevance of the traditional channels, but argues that the role of financial globalization as a catalyst for certain collateral benefits may be more important in increasing GDP/TFP growth and reducing consumption volatility.

The current literature on globalisation and economic growth may well be reflected in the above figures A and B. At the same time, the emergence of regionalism since the Second World War has created a new impetus to look at the process of globalisation and economic growth not only in the context of national institutional reforms and national accountability but also in the context of regional integration and its dynamic effects on the process of national institutional reforms for those countries forming that union. Furthermore, the role and the effectiveness of international institutions such as the UN, the IMF and the World Bank also come into question as a way of facilitating the process of national reform and coordinating the efforts of all nations.

Stulz (2005) argued, financial globalisation will reduce the “twin problems”, however the question is what are those factors which are capable of removing national bottlenecks as a way of removing limits to financial globalisation. Li et al (2006) showed how corporate governance could be a major factor for flows of capital and hence
financial globalisation.

One of the factors that contribute to a reduction in home bias and hence an increase in financial globalisation is regional financial integration. The US integration in the 19th century and the recent regional financial integration in the EU are examples that we could use to consider the effects of financial integration on firms and other private investors’ activities.

With respect to the role of regionalism in the process of globalisation, one can note the emergence of the EU, APEC, ASEAN and NAFTA, as amongst the key regional collaborations. However, the most successful Post War integration was the process of integration amongst the European countries which ultimately led to the emergence of the EU. Moshirian (2006 and 2007) has analysed those factors that could accelerate the process of globalisation and lead to the emergence of effective international institutions. It should be noted that both national and international institutions should take responsibility for the challenges facing the 21st century, as the global economy is highly interdependent. Thus, by simply requesting national governments or people themselves to take full responsibility of what is happening in the current global society, one may be overlooking international forces and factors that equally and sometimes more have a role to play in the process of globalisation.

5. Conclusion

The purpose of this paper has been to consider those factors that contribute to the process of globalisation and economic growth. The paper has analysed the ways the process of globalisation has evolved since the 19th century. It has analysed different measures of economic growth and prosperity such as GDP and the Human Development Index. It has considered the role of Technology as a way of increasing productivity for sustained economic growth. The paper has analysed the benefits of financial globalisation and the ways in which some nations have benefited from the flows of foreign capital. While the empirical research shows that globalisation has positive effects on economic growth, the overwhelming support for sustained growth is coming from reforms in national institutions. Those countries that have been able to embark on and sustain national reforms, including better corporate
governance and better banking systems have been able to benefit more from the process of globalisation.

The process of globalisation started in the 19th century. We have observed a significant change in the global economy since the Industrial Revolution. The Emergence of international institutions such as the UN, the IMF, the World Bank and the WTO have contributed to the process of globalisation in the 20th century. At the same time, it is important to consider the role of more effective international institutions in the 21st century. The process of regionalism has contributed to the process of globalisation, as we observe the way countries in Europe are working together with the EU or nations are trying to have more free trade and financial integration under APEC. At the same time, it is important to see effective national institutions in place which are committed to ensuring that national policies will be well implemented with the view to ensuring that national and regional governments and institutions are also playing their role in the process of globalisation. Furthermore, individuals as national as well as world citizens should play their role in contributing to effective process of globalisation in such a way that all people and nations could benefit from an increasingly integrated global economy.
References


Li, D, F. Moshirian, P. Pham and J. Zein, “When Financial Institutions are Large Shareholders: The role of Macro Corporate Governance Environment”, Journal of Finance, 61 (6), 2975- 3007, 2006


## Table A - Human Development Index

<table>
<thead>
<tr>
<th>Country</th>
<th>Human development index (2004)</th>
<th>Life expectancy at birth (men)</th>
<th>Adult literacy rate</th>
<th>Combined gross expenditure ratio for primary, secondary and tertiary education (%)</th>
<th>GDP per capita (PPP$)</th>
<th>Life expectancy at birth (women)</th>
<th>Education index</th>
<th>GDP Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>0.965</td>
<td>79.8</td>
<td>...</td>
<td>1.01</td>
<td>69.1</td>
<td>0.99</td>
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<td>3.00</td>
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<td>0.94</td>
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<td>...</td>
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Source: The same as Table B.
Table D - Growth Accounting: Comparison of Sources of Growth
(percent per year)

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<th>TFP (percent)</th>
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<td>0.7 (32%)</td>
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Source: The same as Table B.
Comments and Observations on the Paper by Fariborz Moshirian Aspects of economic Growth and Globalization

Boris Vujčić
Deputy Governor, Central Bank of Croatia

The paper by Fariborz Moshirian on globalization and growth is broad in scope. To a large extent the paper is an overview of the literature on globalization and growth, with an emphasis on the effects of financial globalization and the role of institutions. First two thirds of the paper is a journey through different strands of literature on growth effects of the process of globalization, in particular financial globalization. Author gives a good, although not exhaustive, overview of the main findings.

In the last section, paper analyzes the way the financial integration in Europe could be used as a model for increasing the flows of foreign capital into developing countries. This comes almost as a separate paper. Although it deals with aspects of financial globalization, this part of the paper is different by structure than the rest of the paper. It outlines, in much more detail, the author’s view on the single topic, rather than shortly describing numerous findings in the literature on globalization and growth, as is the case in the first part of the paper.

In fact, there are two papers. One, which is basically an overview of the field, and the other, that deals with the financial integration in Europe as a potential model for other countries. It might be better to separate them into two papers, as in the current format, none of them is given enough space to do what they want to or should do. Overview is given 15 pages, while “EU as an financial integration model” only 7.

“Overview” part (first five sections) briefly reviews the process of (financial) globalization, some benefits of the globalization and role of institutions. It ends with the now prevailing “compromise” between globalization enthusiasts (let’s call them “Fischer”) and globalization sceptics (let’s call them “Stiglitz”): financial globalization can be beneficial
if good institutions and quality of governance is in place, together with fiscal discipline and macro stability. In other words, globalization will benefit countries that do things well, and are already ripe for full opening-up to free movement of goods, capital and maybe even workers. Those that are not, should be careful how they pace opening-up.

Second part looks into the success of the European financial integration. Moshirian analyzes the process of the financial integration in the EU, to conclude that national institutions with right incentives more easily integrate into the global economy. They do it more efficiently and reap the benefits of globalization better. The right incentive, or the big carrot in front of the transition country governments, is the EU entry with all its positive features for a transition economy - credibility effect, increased foreign direct investments and significant inflows of grant money from the EU funds.

It is undeniable that the European (financial) integration has brought benefits to the EU member states. It started fifty years ago, with the start of the free trade zone, and has gradually evolved into something that increasingly looks like the true single market. Latest steps are in the direction of the financial integration with the introduction of the single currency, Financial Services Action Plan and Lamfalussy process. Financial integration in Europe is still not completed, and it will take more years before it can be compared to the financial integration in the US, but already in the current format, it brings clear benefits to the EU member states, i.e. citizens.

The economic idea behind the process is that better financial intermediation raises productivity growth and enhances consumer welfare. That theoretical proposition has been empirically tested and confirmed. However, essentially, monetary/financial integration is a political process, like the whole EU project.

How did the synchronization of real activity and financial integration in Europe proceed? Increased synchronization of real activity started in the early 1980s, while increased integration in equities markets started in the early 1990s. Money market got fully integrated after the European Monetary Union was launched. Also, bond market integration was a big success. However, banking/retail market
remains fragmented, settlement system as well, home bias, although on a declining trend, is still pervasive. Recent study (IMF, 2007) shows that almost 0.5 per cent of lower productivity growth in euro-zone compared with the US, between 1996-2003, can be accounted for by financial intermediation, while indirect effects may be even larger.

Financial globalization/integration implications for growth are still ambiguous, but most of the research finds positive impact of financial sector integration in Europe on growth. Better and more complete financial intermediation at lower cost raises productivity growth and increases consumer welfare. Through financial integration Europe has reaped some, but not all, of these benefits. More depends on a more complete integration, i.e. implementation of Financial Services Action Plan and Lamfalussy process, as well as more cross-border activity in the banking industry, which seems to be slowly gaining the ground with the start of financial sector mergers and acquisitions in the “old” member states. That process has proceeded much faster in the “new” member states, whose banking systems are already dominated by euro-zone banks. Therefore, “new” member states are reaping benefits of financial integration quickly, although that process carries some risks as well.

As De Nicolo and Tieman (2005) point out, if a more integrated Europe is becoming more prone to systemic risk, then across-the-board policies to limit risk taking or at least limit the effects of risk taking on financial institutions and the real economy might be needed. On one hand financial integration is beneficial for the EU, but on the other, problems of supervising risks in an integrated environment seem bigger than supervising individual banks, and the question is if the supervision, in its current format, is fully enabled to deal with them in a most efficient way.

Recent financial market turmoil demonstrates to some degree contagion effects, i.e. risks of financial globalization. Supervisors will need to monitor more closely systemically important parts of the market, transparency in the market, in a sense of risk distribution will need to be increased, and the role of rating agencies will come under scrutiny of regulators as a consequence. In essence, this is not very different from what has been happening in the past in the financial markets. Financial
innovations were often followed by regulatory measures to contain the risks associated with it. Financial market developments, including financial market integration/globalization, over the last decades have helped better functioning of the markets and more efficient risk sharing, but new risks have also emerged that have to be dealt with.

Recent empirical evidence on the effects of globalization on the output volatility - growth relationship demonstrates that growing international trade and financial integration has weakened this traditionally negative relationship (Kose et al.). Also, financial market integration helps growth in the EU (Guiso et al.)

With developing countries, however, it is much more difficult to empirically establish a positive link between financial globalization and growth. One of the problems is that they are much more vulnerable to shocks/crisis some of which are enhanced by globalization, and the negative impact of shocks on growth is not the effect of small repeated cyclical deviations, but of large drops below output trend. The volatility due to a crisis and not due to normal times harms the economy’s long-run growth performance.

Why are developing countries more vulnerable to shocks? One reason is a lack of financial development. Lower the financial development, less efficient is a resource allocation and risk sharing among individuals. Therefore, more vulnerable the economy will be.

Other reason might be institutional underdevelopment which usually implies weak regulatory structures, corruption, legal uncertainty etc. Also, inadequate macroeconomic policies, i.e. inability to conduct countercyclical fiscal policies, poor monetary/exchange rate management, uncontrolled financial market liberalization are not independent of weak institutions. And they all make countries more vulnerable to shocks or even provoke crisis if they create wrong incentives.

It is often the case that developing countries are highly dependent on few commodities which makes them more vulnerable to price shocks to those commodities, while developed countries are more diversified and, therefore less sensitive to such shocks. Another reason why developing countries are more vulnerable to shocks is their
technological disadvantage. In agriculture, for example, more developed countries use more machinery, fertilizers, pesticides, irrigation etc. while in manufacturing they use better more complex technologies and more varieties.

In the empirical research the effects of one aspect of globalization - trade openness - on volatility-growth link appear quite ambiguous, but could hardly lead to policy advice to close the economy to trade. However, it demonstrates that developing countries could also be negatively affected by globalization, due to their higher vulnerability to terms of trade shocks or high capital flow volatility, which is often associated with opening up of the economy in a globalized environment.

At the lower levels of development crises are more likely to be induced by supply/demand shocks like TOT shocks in commodity markets, while at intermediate levels of development they are more likely to take some form of BOP/Banking/Currency crisis, which can again be induced by adverse supply/demand shocks, or/and by poor macroeconomic/regulatory management.

Typically, these factors that make countries more vulnerable to shocks come in bundles, i.e. they are correlated.

From the above list of causes of vulnerabilities it follows that, in order to deal with vulnerabilities that might arise from globalization, most often one has to deal with growth issues at large.

And what are the policies to deal with possible negative impact of globalization/crises? Bottom line is, that after a long detour through empirical research and some theory - the globalization/volatility/growth literature brings us right back to basic policy issues: how to build institutions, how to sequence reforms, how to improve governance, political economy of fiscal policy etc.

Economists know very well that we need to build competent institutions, robust financial and regulatory systems, flexible labor markets, run countercyclical fiscal policies, eliminate corruption, diversify exports, output and tax base etc., but it is much less obvious why, in so many cases, it does not happen. Most of the growth literature leads us to the history and geography as main explanations why some
countries are better able to cope with those issues, while others are not (which would seem to be a too good excuse for policymakers).

One can also ask to what extent is CEE success incentive based, and to what extent it is explained by “distance to Bruxelless” and “common history”? Empirical literature on growth usually leads us to later as the main explanation why these countries did so well during the transition.

Of course, politics is extremely important (politicians rule the world, not the economists) but, what makes politics change? When we look at the growth literature we end-up, again, with the same answer - history and geography. That is, I know, quite discouraging answer to important questions, and should never be used as an excuse for policymakers, but that is where decades of growth literature take us. Globalization cannot change the history, but is affecting geography. That’s why it is so important.

References


Objective of the Paper

• To review the globalization literature as it relates to growth and how the process has evolved over time.

Why the Interest in Globalization?

• Financial markets have been liberalized dramatically in many countries over the last three decades.
• What should be the effects of financial liberalization?
• Theoretically financial liberalization should improve the allocation of capital and increase economic growth.
• The growth effects of financial liberalization, and therefore arguably one of the most important benefits, have not been easy to demonstrate in cross-country data.
• At the same time, worries persist that financial liberalization may result in higher volatility.

Approach of the Paper

• Examines two globalization phases
  • 1870 to 1914
  • Early 1960s to the present
• Defines Globalization
• Examines the Trends in Growth Indicators: GDP and HDI
• Benefits of Financial Globalization
• The Role of National Institutions in Contributing to Economic Growth
Regional Financial Integration as a Contributor to Globalization and Growth

Globalization

- The important question is: What is Globalization?
  Globalization can be defined as the increased integration of economies, reflected by increases in trade, capital, investment and migration flows Masson (2001).
- The 1st wave 1870 to 1914 –driven by reduction in transportation costs.
- The 2nd wave started in early 1960s and continues today –driven by technological advances.

The Earlier Globalization

- One of the strengths of this paper, and among other things that separates it from other survey papers is the examination of the first globalization wave.
- This is important in that valuable insights can be gained by policymakers and academicians by comparing and contrasting the two waves.
  - A more in-depth comparison of the two would be helpful in providing a deeper understanding of globalization, and therefore to better understand the current globalization.
  - One of the reasons that we study history is to learn from it -what works and what does not work so we can avoid the previous mistakes.
  - Thus an important question is: What have we learned from previous wave that would help policy makers in the present globalization wave?
  - For e.g., earlier wave was much more successful in terms of leading to economic growth than the more recent wave -do we have any insights as to why this is the case?
The Second Globalization Wave

- The Primary focus of the current paper is a discussion of the second (current) globalization wave
- Characteristics of the second wave
  - Significant technological changes
  - Financial globalization
  - Open government policy

Second Globalization Wave

- The paper alludes to the fact that one of the issues with conducting empirical research that examines the effects of globalization is trying to establish cause and effect among the three aspects of the current globalization wave listed previously -i.e., the issue of endogeneity (more about this later)
  - Although the paper does speak about the second wave, given its importance more discussion on this issue as it pertains to the previous three aspects of the current globalization would be beneficial. By doing so we would be able to get additional insights as to the underlying cause of the unevenness of growth across countries.
  - Important questions that it would help us to answer, among others, are: Does globalization success or lack thereof depend on the extent of financial integration? Is there a first mover advantage in terms of financial liberalization?

Impact of Globalization

A summary of the impact of the current globalization wave is as follows:
- Less money is flowing from rich countries to poor countries –in fact just the reverse is observed
- Economic growth has been at best modest -only a small number of developing countries have in fact experienced significant economic growth
- Total factor productivity has not increased
- FDI now accounts for more than 50 percent of all capital inflows in the developing countries
Measurement of Globalization Success

• Important insight of this paper is that a possible reason that the results have been less than overwhelming is that the metric being used is too narrowly defined
• Metric typically used is GDP growth
• A preferred metric is HDI

Measurement of Globalization Success (contd.)

• Increased discussion of HDI would be helpful. This should include among other things:
  • A More complete definition
  • The reason that this measure is preferred in comparison to other more comprehensive measures than GDP
  • How does it stack up to other measures
  • If possible a discussion of the impact of the different components of HDI—this would provide possible additional insights as to why this globalization wave has been less than successful

Other Measurement Issues

• The paper also emphasizes the issue of endogeneity and how it can lead to faulty inferences
• For instance, did technological advances lead to financial globalization or vice-versa?
• Several recent papers have tried to address this issue:
  Levchenko, Rancière and Thoenig (2007) use: (i) both de jure and de facto measures of globalization; and (ii) a difference-in-differences approach along with propensity score matching. They do not find strong evidence that financial globalization significantly affects economic growth but do find that liberalization increases the volatility of output
• Baltagi, Demetriades, and Law (2007) use a dynamic panel data approach and also do not find strong support
The Long-run (?) Effect of financial Globalization

(Taken from Levchenko, Ranciere, and Thoenig, 2007)

Figure 1. The Time Evolution of the Effect of Financial Liberalization

Effects (contd...)

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A More Recent Approach to Examining the Economic Impact of Globalization

- One way to address this important question (the impact of globalization) is to go beyond country-level analyses and delve deeper into the data.
- Papers that have followed this approach are Gupta and Yuan (2007) and Levchenko, Rancière and Thoenig (2007)
- Following the approach of Rajan and Zingales (1998, AER) these papers use industry-specific data to investigate the particular microeconomic channels by which financial liberalizations may facilitate economic growth

Industry Evidence

- Results of Gupta and Yuan (2007) suggest that:
  - Liberalization benefits some industries more than others
  - Industries that are more dependent on external finance and industries that experience a greater reduction in the cost of capital grow significantly faster following liberalization
  - Industries that face better growth opportunities do not appear to benefit from liberalization
  - The increase in growth occurs mainly through an expansion in...
the size of existing firms rather than through the entry of new firms

Industry Evidence

• Levchenko, Rancière and Thoenig (2007) also find that the development is uneven across different sectors. In addition they find that:
  • Decomposing the positive growth effect into channels, financial liberalization raises entry of firms, total employment, and capital accumulation
  • No evidence that financial liberalization impacts productivity growth
  • Where effect is present the impact is temporary rather than permanent
  • The only persistent effect is on competition: the impact of financial liberalization on the price-cost margin a measure of markup increases progressively for the first few post-liberalization years, and remains significantly negative.

Implications of Results

• Gourinchas and Jeanne (2006), among others, indicate within the context of a neoclassical framework that the gains from liberalization in terms of capital accumulation are actually quite small
• Thus, if financial liberalization is to significantly impact growth, productivity growth must also increase
• Although growth of output, employment, and capital accumulation increases, albeit temporarily the preponderance of evidence is that productivity growth is not affected
• This therefore is a possible explanation why the pro-growth effect of financial liberalization has been so difficult to detect empirically in cross-country studies

Implications of Results (contd.)

• Possible explanations for the lack of productivity growth:
• First, the relaxation of financial constraints resulting from liberalization leads to entry by firms which are less productive than the average. Financial liberalization matters most for the less productive firms, which are financially constrained.
• The second explanation relies on the empirical finding that markups decrease significantly with liberalization (Levchenko, Rancière and Thoenig (2007)). If innovation occurs through prospective entrepreneurs attempting to undertake projects, the reduction in markups and therefore profits also lowers the incentive to innovate.
• Through this pro-competitive mechanism, relaxation of financial constraint has the effect on TFP growth that is opposite of what is normally presumed

The Role of National Institutions in Contributing to Economic Growth

• An important aspect of this paper and which is a focus of the recent literature is the role of national institutions in fostering growth
• The paper does a very good job in tying the literature together given the various aspects and types of institutions that exist across the many countries
• The consensus is that national institutions constitute an important factor in the process of sustained economic growth and the attraction of foreign capital
• What would be interesting and an important insight that can be provided by this paper is whether national institutions also played an important role in the earlier globalization wave

Is Regional Integration the Answer?

• One of the aspects of this paper that separates it from other survey papers is the discussion of regional integration and its impact on globalization
• The paper points out the importance of regional integration and how it facilitates globalization success
• It suggests that this may be the way to overcome the various impediments to successful globalization—it then identifies the EU as an example of the importance of regional integration in reaping the benefits of globalization
• Other regional integration has been less successful in leading to growth of the lesser developed country—e.g., NAFTA and Mexico
• This then raises the question: What is it about the EU that makes it successful?

The Benefits of Regional Integration

• What are the benefits of regional integration?
  • It facilitates risk sharing by lowering the barriers that prevent this from happening
  • One of the most important barriers is home bias
  • This is not only important for risk reduction in asset portfolios but also for consumption smoothing
  • In theory, one of the main benefits of financial globalization is that it provides increased opportunities for countries to smooth consumption growth in the face of idiosyncratic fluctuations in income growth
  • With well-developed domestic financial markets, economic agents within a country can share risk among themselves. However, insuring against country-wide shocks requires openness to financial flows that would allow agents in different countries to pool their risks efficiently
  • Thus, financial globalization should generate welfare gains by reducing the volatility of aggregate consumption and also by de-linking national consumption and income (see, e.g., Kose, Prasad, Rogoff, and Wei, 2006)

Risk Sharing

• Theoretically, one of the main benefits of financial globalization is that it should allow for more efficient international risk sharing. Thus how international financial integration has affected the evolution of risk sharing patterns is an important aspect of the impact of financial
globalization

• The evidence (see, e.g., Kose, Prasad, Terrones (2007)) is that there is at best a modest degree of international risk sharing, and certainly nowhere near the levels predicted by theory
• Only industrialised countries have attained better risk sharing outcomes during the recent period of globalization. Developing countries have, by and large, been shut out of this benefit
• The most interesting result documented in the literature is that even emerging market economies, which have witnessed large increases in cross-border capital flows, have seen little change in their ability to share risk
• Importantly neither the composition of flows nor country characteristics—including policies, institutions and financial market development—can explain why emerging markets have not been able to realize this presumed benefit of financial globalization

The EU and Risk Sharing

• The current paper highlights the work of DeSantis and Gerrard (2006) in showing the successful reduction of home bias in the EU
• Giannone and Reichlin (2006) document an increase in the extent of risk sharing among European countries during the early 1990s when financial integration in Europe started gaining momentum
• Their results are stronger at longer time horizons, implying that these countries have used financial markets more effectively to insure against relatively more persistent shocks
• Sørenson, Yosha, Wu and Zhu (2006) analyze the relationship between home bias and international risk sharing. They document that the extent of international risk sharing among industrial countries has risen during the late 1990s while home bias in debt and equity holdings has declined
• They find that there is a positive association between foreign portfolio assets and the extent of income risk sharing. In addition, they document that FDI holdings and the degree of consumption risk sharing appear to be positively correlated
Interpretation of the Evidence

- One of the issues mentioned in the paper is that of a threshold effect—that is in order for countries to reap the benefits of globalization they have to achieve a certain level of integration
- This is a possible explanation for the success of the EU because, in general, industrial countries that are substantially integrated into global financial markets seem to enjoy the risk sharing benefits of financial globalization
- This suggests that, in order to reap the benefits of financial integration in terms of improved risk sharing, developing countries need to become more integrated into global financial markets

Achieving the Threshold Effect

- How can this be achieved: The paper suggests that an important facilitator of this is to have a common currency
- Benefits of a common currency—Interest rate risk is a priced thus having a common currency reduces the risk premium
  - Francis and Hunter (2003) show that following the adoption of the EU the foreign exchange risk exposure of stocks is reduced
  - Francis, Hasan and Hunter (2006) show that following the introduction of the euro, volatility spillovers across both stock and currency markets are reduced
  - Francis, Hasan and Hunter (2007) show that following the adoption of the Euro both the price of risk and the exposure to currency risk is reduced
- Thus the cost of capital is reduced
- Although not mentioned in this paper, I contend that an important benefit of a common currency is the gaining of trust among the countries belonging to the EU.
- Although its importance is long accepted in the management literature only recently has it come to the forefront in the finance literature (see, e.g., Chuido, Sapienza, and Zingales (2007) and Helliman et al. (2007)
Abstract

This paper extends the line of research attempting to link innovation to economic growth by addressing some unexplored questions. Using a global patent database, this paper empirically investigates the importance of both quantity and quality of innovation on economic growth. Moreover, our research work examines how innovation inputs can be translated into per capita growth under the variation of difference economic structure and stages of economic development. Based on a sample of 58 countries for the period 1980-2003, our empirical results indicate that those countries that increase the level of patenting also witness a concomitant increase in economic growth. Furthermore, we have some evidence that countries hosting firms with higher quality patents also have higher economic growth.

JEL Classification
Keywords: Innovation, Economic Growth, Patents
INNOVATION AND ECONOMIC GROWTH

1. Introduction

Economic growth, especially its long-run sustainability, has long been a focal point of academic researchers and policy makers. Numerous attempts have been made to provide a long list of factors that may have an impact on economic growth. Pioneering work on endogenous growth by Romer (Romer 1986), Lucas (1988) and others emphasizes the role of knowledge as an input to production. In their models, it is the technological advancement and industrial innovation that drive long-run growth (Grossman and Helpman 1994).

In addition, since at least the time of Schumpeter (1932), the process of industrial innovation has been seen as important to the economy. Schumpeter wrote of the renewing power of “creative destruction” in which new technologies had the potential to disrupt and even replace existing industries with superior products and services. When Schumpeter wrote about innovation, he clearly intended to emphasis not only the “destruction” aspect of creative destruction, but the “creative” part as well (Freeman, 1982).

In the field of economics, research on endogenous growth theory sparked many empirical studies exploring how and to what extent innovation might contribute to economic growth. Empirical evidence points out the fact that innovation tends to make significant contributions to growth, and there are also significant spillover effects of innovative activities (Cameron, 1998). In this paper, we aim to extend this line of research by arguing that not only the quantity but also the quality of innovation matters in promoting economic growth. Furthermore, we are interested in investigating whether the effects of innovation on economic growth largely depend on the economic structure and stage of development in different countries.

In the models of Romer (1986, 1990) and Stokey (1995), among others, industrial innovation activities are an important determinant of economic growth due to their direct impact on the production process and also due to positive externalities. Scholars have also argued that “national innovation systems” — which include aspects of how intellectual property is protected and how research and development (R&D) is funded — is a major contributor to innovation activities (Nelson, 1993; Freeman, 1982).
Though technological change forms the engine of long-run growth, accumulation of other types of capital will still play an independent role during a transitional phase (Grossman and Helpman 1994). This notion implies that how innovation activities can be translated into different rates of growth is closely linked to the variation of economic structures and policies (Grossman and Helpman, 1994). In this paper, we make use of a global patent database to construct our measures of innovation and empirically examine the proposed research questions. We use a panel of data to investigate the potential relationship between measures of the innovations, both quantity and quality, and economic growth. Based on a sample of 58 countries for the period 1980-2003, our empirical results indicate that those countries that increase the level of patenting also witness a concomitant increase in economic growth. Furthermore, we have some evidence that countries hosting firms with higher quality patents also have higher economic growth.

The rest of this paper is organized as follows. Section 2 provides a brief review of related literature. Section 3 explains our data collection and discusses some methodology issues. Section 4 presents our empirical results. In Section 5, we summarize, discuss and conclude.

2. Literature review

Questions about the sources of economic growth have fascinated economists for many years. Neoclassical growth models posit that the rate of return on investment is a decreasing function of per capita capital stock, and per capita outcomes across different countries should converge to a steady state in the absence of exogenous technological change. However, these predictions are somewhat inconsistent with observations from the real world. Without a doubt, technological advancement has become a major factor behind economic growth by providing a new means to combine raw materials together in production. It is unrealistic to attribute all the unexplained part of economic growth to exogenous technological shocks.

Several studies attempt to incorporate industrial innovation into models to explain economic growth. Romer (1986) showed that knowledge with increasing marginal productivity could be an input in explaining long-run growth. In a competitive economic environment, intentional investments in innovation activities are motivated by
market incentives (Romer 1986; Aghion and Howitt 1992; Stokey 1995). Treating technological changes as endogenous, Romer (1990) presented a model of the growth rate being determined by the stock of human capital, even though new technology is assumed to be no better than old (horizontal product innovations). Aghion and Howitt (1992) developed a model in which vertical innovations make existing products obsolete, becoming the underlying source of growth through “creative destruction.”

The innovation process has its own externalities. The accumulation of technological advancement enlarges the knowledge base and makes sequential innovations available (Stokey 1995). Knowledge flows and technological spillovers across economic agents benefit all firms including rival firms as well (Griliches 1992). Even when technological spillovers do not exist, an agent does not appropriate all the social gains from her innovation unless she can price-discriminate. In addition to the efforts made by profit-maximizing firms, academic research funded by public resources in universities and other institutions provides substantial inputs and spillovers into the innovation process (Fagerberg 1994).

Innovation activities do not only directly influence economy-wide productivity, but also promote economic growth through spurring new business formation, which will further promote employment growth and other outputs (Kirchhoff 1994; Wennekers 1999). Innovation encourages and facilitates entrepreneurs to create new organizations in order to enter certain industries characterized by an entrepreneurial technological regime (Audretsch 1995). This indirect mechanism has been supported by empirical evidence (Francis, Hasan and Wang 2007; Kirchhoff, Newbert, Hasan and Armington 2007).

Summarizing the above, innovation can be considered important for potential economic growth. So what evidence do we have that it is linked to growth, and at what levels of analysis? Various studies have been conducted at the level of individual firms, industries as well as countries. Cameron (1998) surveys the existing literature on this topic and concludes that the majority of these studies find a strong and positive link between innovation and some measures of output (Mansfield 1980; Griliches and Mairesse 1986).

Meanwhile, many other studies attempt to investigate the spillover effects of innovation. For example, David and Helpman (1995) and Bayoumi, Coe and Helpman (1999) have documented that international trade can greatly raise a country’s total factor productivity. There are
many reasons for this, but one factor could very well be knowledge transfer due to international trade. However, there is a limitation for such spillovers across countries. Audretsch and Feldman (1996) find that innovation spillovers tend to be localized in the sense that industries with a prevalence of knowledge spillovers have a high propensity to be clustered. For example, there may be important barriers to knowledge flow between even European countries (Maurseth and Verspagen (2002) and Bottazi and Peri (2003)).

How to precisely measure innovation is an important issue in the empirical endeavor to explore the effect of innovation on growth. In the existing literature, research and development (R&D) expenditures are widely used as a proxy for innovation partly because of the availability and reliability of data (Griliches 1980; Mansfield 1980; Audretsch and Feldman 1996). Many other researchers intend to use alternative measures of innovation such as patenting activities. Despite several major problems associated with using patent data, there are at least three reasons why patent statistics can be an important economic indicator of innovation (Griliches 1990) and thus the fascination of economists in academic research. First, patenting databases are generally more available and richer in the sense that patents are public documents with detailed information on the background of assignees and their activities. Second, patents can be viewed as the output of inventive process and link together R&D activities and productivity. Finally, using patent data, we are able to construct both quantitative and qualitative measures of innovation activities, and trace the citation records to better gauge the spillover effects of technology changes.

To our best knowledge, there are no comprehensive studies examining innovation and economic growth in a cross-country setting using patent data (Maurseth and Verspagen 2002; Bottazi and Peri 2003). In this paper, we try to fill this void by constructing a cross-country sample, and address some unanswered questions with the help of a recently available global patent database. Particularly, we attempt to add knowledge to existing literature by focusing on the effects of both quantity and quality of innovation on economic growth. Additionally, we explore the impact of innovation at different stages of development for different countries.

The above leads to the following two hypotheses:

H1 The higher the level of innovative activity, the higher the rate of economic growth in an economy.
H2 The higher the quality of innovative activity, the higher the rate of economic growth in an economy.

3. Methods

Empirical research using cross-country data has provided much insight on the role of institutions in promoting economic growth (King and Levine, 1993; Knack and Keefer, 1995; Rousseau and Wachtel, 2000). However, as mentioned above, very few cross-country studies are associated with any potential association between direct measures of innovation and growth.

Data sources

The data set was constructed from a number of sources. We started with the US Patent database available from the National Bureau of Economic Research and examined the country of both the inventor and the assignee. Work by Jaffe, Trajtenberg and Henderson (1993) and Jaffe and Trajtenberg (1999) suggest that patent data can be considered one measure of innovation. Unlike an exogenous technological shock, intentional investments in R&D are driven by profit incentives. Among other forms of protecting intellectual property, economic agents are likely to file patents to protect the property rights generated by their private investment in R&D. Moreover, patent documents themselves contain references to prior patent documents and influential innovation tends to be heavily cited. Patent citations can thus in some circumstances be interpreted as knowledge flows from one invention to another (Jaffe, Trajtenberg and Fogarty, 2000; Jaffe et al., 1993; Duguet and Macgarvie, 2005),¹ and can be used to identify those innovations with a breakthrough impact. Therefore, patent data to gauge the size of innovation as well as the quality of innovation. We combine observations from countries as described below, so we have one observation per country per year.

GDP and other macroeconomic data for the countries are taken from the World Development Index (WDI). R&D figures for individual firms inside countries were obtained from the WorldScope database.

¹ Note: the structure of the US national innovation system in which the applicants supply many prior art references leads to this interpretation. However, it should be noted that in the European Patent Office, the examiners provide the prior art citations and thus any knowledge flow interpretations are unwarranted (Harhoff, Hoisl, and Webb 2006).
Variables

Descriptive statistics and variable names are shown in Table 1, and Table 2 presents the correlation matrix of the variables. The mean real GDP growth rate is 2.03 percent and the standard deviation twice as large. The explanatory variables also show a great deal of variation. Their range indicates that there are outlier observations though no effort was made to exclude such observations other than to include fixed effects for countries in some regressions. Interestingly, the simple correlations with the growth rate of GDP are all modest. The level of GDP is highly correlated with capital formation and moderately correlated with FDI, $RNDGDP$, and $TPATR$ (defined below). Interestingly, the correlation of the level of GDP is not as highly correlated with the Technology Index (also defined below).

Dependent variables

Our dependent variable, growth, is the growth rate of real annual per capita GDP in the country. The variable is defined as the change in the log of real per capita GDP. Real per capita GDP is defined as per capita GDP deflated to the base year of 1980.

Independent variables

A major challenge in this paper was to determine what an appropriate proxy was for innovation. In the past, scholars have used R&D as a measure of innovative activities and in firm-level studies argued that R&D is more of an input to the actual output (Schmookler, 1966). Teece (1986) proposes that “an innovation consists of technical knowledge about how to do things better than the existing state of the art.” One criterion of a patent is “commercial applicability,” which points to the need for patent protection as a kind of insurance policy against appropriation (Hall, Jaffe, & Trajtenberg, 2001); further, counts of the number of patents have been used as a proxy for innovation (e.g., Ahuja and Katila, 2001) with recognition of their limitations.

We employ both R&D and Innovation variables in our estimates. The actual R&D variable considered, $RNDGDP$, is the total research and development expenditure in the country as a ratio to the GDP of the country. In cases where such number was not available e.g., Egypt, we simply summed the R&D spending of all firms reporting in the WorldScope database. Second, we took the actual number of patent granted to a respective country regardless of where the patentee actually
resided as long as the company was headquartered in the country. In other words, if Siemens were the assignee of a patent in the US patent database, regardless of whether the lab itself was in China, the patent would be assigned to the country Germany, which is where Siemens is headquartered. In our paper we operationalize the variable by taking the number of patents granted per million dollars of R&D.

Next, we focus on the quality aspect of the innovations. The most appropriate measure would have been to get a quality measure based on Hall et al.’s (2002) method, i.e., forward citations of each patent relative to other patents in its technology class in that year, aggregated up to the country level. We were somewhat successful in gathering the citation numbers for most of the sample countries; however, after careful evaluations we could not defend the reliability of the numbers. Therefore we took an alternative variable, USAR, defined as the Ratio of Patents Granted in the USA as a proportion of total patents granted by the country in a given year as the quality proxy for innovation. Our assumption is that the patent applications of foreign countries granted in the US are usually significant innovations and represent relative quality. We also estimate another quality variable, which we call Magic in the Air (MAGIC) by regressing R&D on innovation and taking the residual from this regression. Our perspective here is that while it is plausible that innovation is a product of R&D, it is also possible that innovation may come to an organization or to a country beyond the proportion of the R&D spent due to several spillover effects from other unobserved variables.

Control variables

We use a number of independent variables popularly used in the literature in cross-country growth estimations. Initial GDP Values are useful to understand the relative changes from sample countries exhibiting a wide range of development stages. Capital Formation (GCAPFORM) and Literacy Rate (LITRATE) are common proxies for capital and human capital, respectively, of the countries. So is Government Spending (GCONGDP). Exports and Foreign Direct Investments (FDI) are considered crucial to economic growth. We also include a Technology Index variable to control for the technological sophistication of the respective countries. This index was developed from a number of variables: electric power consumption (kwh per capita), fixed line and mobile phone subscribers (per 1,000 people), personal computers (per 1,000 people), radios and telephone sets (per 1,000 people).
**Statistical approach**

Our model builds on the approach to growth equations introduced by Barro and Levine (1991). As mentioned earlier, the baseline equation includes crucial variables such as the convergence effect (log of initial real GDP), the human capital investment variable (literacy) and the export ratio (openness). We also add a few other relevant variables. The baseline regression provides a reasonable framework for analyzing growth in a cross-country environment. We then add measures of research and development and innovation (patent) proxies. We start with OLS regressions that are shown in Table 3 with robust standard errors. Table 4 follows the same procedure except the dependent variable takes three-year averages of growth as the measure of country growth. All estimates control for year and country fixed effects. It is well known that OLS estimates are biased and inconsistent when there are dynamic effects and simultaneities in the specification. To account for these effects, the recent literature (e.g., Levine et al., 2000, Beck et al., 2000) has employed the Generalized Method of Moments (GMM) technique developed by Arellano and Bond and others for panel estimation. While not reported here, we did employ this technique as a robustness check with nearly identical results.\(^2\)^\(^3\)

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\(^2\) The Arellano Bond GMM technique is specifically designed to address the econometric problems induced by unobserved group-specific effects and joint endogeneity of the explanatory variables in lagged-dependent-variable models, such as growth regressions. Similar to Levine et al. (2000), we employed an augmented GMM procedure outlined in Arellano and Bover (1995) and developed in Blundell and Bond (1998), which combines the regression in differences with the regression in levels (see Bond 2002). We used the two-step GMM instead of one-step because two-step is asymptotically more efficient, meanwhile we also compensated for the potentially downward biased two-step standard errors by making a finite-sample correction to the two-step covariance matrix derived by Windmeijer (2005).

\(^3\) There are two tests to test the validity of the instruments, as suggested by Arellano and Bover (1995) and Blundell and Bond (1998). The first is the Sargan test or Hansen test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. We conducted the Hansen test because the Sargan statistic is not robust to heteroskedasticity or autocorrelation while the Hansen statistic, which is the minimized value of the two-step GMM criterion function, is. The second test is the autoregressive (AR) test, which examines the hypothesis that the error term is not serially correlated in both the difference regression and the system difference-level regression. By construction, the differenced error term is allowed to be first-order serially correlated, but the second-order serial correlation of the error term will violate the assumption of the GMM procedure.
RESULTS

Tables 3-4 show the results of our regression analyses. Each column in the table represents a different model. Let us begin with Table 3, which shows results for per capita GDP growth in relation to innovation and growth variables. Table 3 is grouped into three different groups, with three models per group. As discussed above, the first six rows of the table contain control variables considered to be important in the economic growth literature, plus the control variable Technology Index, plus fixed effects for Year and Country, as shown in Models 1, 4, and 7. The first three models are for the entire combined sample of all 58 countries over the 25-year period. The second and third set of three models split the sample along the lines of income level of the countries, with Models 4-6 showing the results for upper-income countries and Models 7-9 showing results for the lower-income countries.

Each of the regression tables shows the same model specifications. Absolute values of t-statistics are reported in parentheses in all the regression tables and *, **, *** indicate significance at the 10%, 5% and 1% levels respectively. The first equation reported in Table 3 column 1 reports the baseline model. The second equation shows the baseline growth model augmented by the two measures of innovation related variables, RNDGDP (Research and Development as a proportion of GDP) and PATR (Patents Granted per Million of R&D Spending). Similarly, equation three (column 3) introduces a different proxy for innovation (MAGIC) that takes the residual from a separate regression where TPATR is regressed on RNDGDP. The next six columns follow the same order for the two sub-samples. We also estimate a similar regression excluding the USA from the sample (not reported, but highly similar results). We see that the baseline regression provides some evidence of a convergence effect. As the OLS annual and three year equations shows (Table 4) the convergence effect is mostly significant although it is insignificant in the high- and upper-middle-income country subsample. In both annual and three-year average OLS estimations, Gross Capital Formation (GCAPFORM) and FDIGDP variables are consistently statistically significant. The openness or Export variable is positive and statistically significant in a few of the regressions.
Coming to our hypotheses, the first hypothesis proposed that innovation activities are important for firms’ economic growth. This is seen by looking at the second model in each subset of the data (i.e., Models 2, 5, and 8 in each of the two tables). As shown in the tables, the ratio $R&D$ Expenditures to GDP has a positive and statistically significant relation with growth in per-capita GDP. Likewise the ratio of Total Patents Granted to Total R&D Expenditures is positive and statistically significant, indicating an association with GDP growth. The first measure, as discussed above, can be considered an innovation input measure, while the second measure may be considered an innovation output or innovation efficiency measure. Thus we see that innovation input and output are associated with GDP growth virtually across the board. Although coefficient estimates and confidence levels vary somewhat from equation to equation and across tables, the overall picture is supportive of the fact that innovation does matter in explaining economic growth. Turning to coefficients on the measures of $RND$ and innovation variables, we see that $RNDGDP$ has a relatively small coefficient, while $TPATR$ has a larger coefficient that is positive and statistically significant.

The second hypothesis has to do with whether quality innovation output matters. This is shown in the same models as above, plus the third model of each subset of the data (i.e., Models 3, 6, and 9 in each of the two tables). As discussed previously, we take the Proportion of Patents Granted in the USA as a kind of patent quality measure at the country level. Overall, there appears to be some support for this hypothesis: the coefficient of our quality measure is often, but not always, positive and statistically significant. However, when we add the variable $MAGIC$, which represents a kind of factor in innovative output unexplained by the R&D spending, the Proportion of Patents Granted in the USA always becomes statistically insignificant. The overall interpretation offers support for Hypothesis 2, that quality innovation output leads to even higher growth than average innovation output.

In sum, our results show that after controlling for the year and country-specific effects, a strong, positive link between innovative success and economic growth.

**Robustness tests.** In order to boost confidence in our results, we performed various robustness tests in addition to the GMM techniques outlined above in the footnotes. These additional robustness tests
address two important issues. First, we investigate whether the results are consistent if we examine different sub-samples, such as whether the country is known as an “emerging” or a “developed” country market. We also added some additional independent variables used by some authors in the growth literature as control variables, e.g., bank credit to private sector as a proportion to GDP and also private sector to GDP ratio. In these cases above we found strong support for our hypotheses. Moreover, we substituted the quality of innovation variable, proportion of patents granted in the USA, with a new proxy: total number of forward citations of the total granted patents. We could not get consistent data for all sample countries for all sample years. However, we still found a significant association between our focused independent variables and the dependent variable that supports the two hypotheses. In summary, in all instances examined, there were no alarming qualitative changes to our conclusions.

DISCUSSION AND CONCLUSIONS

In summary, we find that the quantity of inventive activity, as well as its quality, are associated with economic growth. We may be able to say that based on OLS results, countries that have higher levels of patenting activity — as well as those whose patents primarily are filed in the US — tend to be the countries with higher growth rates. Furthermore, it seems based on panel regression and country fixed effects that countries that increase the level of patenting activity — or increase the proportion filed in the US — tend to be associated with increases in the growth rate. Thus we find results consistent with both our hypotheses.

One question this raises is one of reverse causality. That is, how do we know that more patents lead to economic growth, rather than countries with high economic growth leads to firms that have more profits to invest, which they then spend on patenting activities? Or it could be that patenting in the US actually leads to higher returns than patenting in the home country due to the size of the US market, which leads to more profits for the firm, leading to growth in the home country (i.e., it is not a question of quality at all, more of path dependency). These questions are difficult to tease apart empirically but in future work we will try and experiment with lagged patenting activity and
ways of distinguishing quality.

Another question that this research raises is related to the locus of the inventive activity itself. For example, outsourcing has been a hot topic in the early 2000s. Is it possible that a country may have much innovative activity but the economic growth occurs outside that country? Put another way, how do we know that if a multinational firm has R&D centers in various countries, the benefits flow only to the country in which the firm is headquartered? Thus one limitation of our study is the inability to tease apart a more fine-grained tracing of patenting and economic behavior. However, for a broad picture, the results seem remarkably consistent and clear.

The public policy implications of the results are also clear. While Lerner (2002) warns that strengthening intellectual property protection does not do much to spur patent applications in countries with already advanced systems, it would seem logical that countries with weaker systems could get many more applications by strengthening their intellectual property rights. Of course, simply applying for more patents does not necessarily translate into either more patents granted or higher quality patents. Certainly, a country should not lower its standards when it comes to granting patents. Maybe governments should subsidize the fees or even award prizes for successfully applying for patents in the US? The US will not lower its grant standards so the overall quality level should remain relatively constant. However, the increased innovation activity to get past the application hurdle and perhaps win the prize may lead to higher economic growth for the entire country.

It would seem that, based on the results of this study, the Lisbon program of simply attempting to raise the level of R&D spending in each European country may not be the most efficient way of increasing economic growth. At a minimum, we may consider it to be part of a multi-pronged approach that includes $RNDGDP$ as one piece. As we know, the goal of most economies is not more R&D spending per se, but rather a higher rate of growth and national wealth that is presumed to result from such investment. As Griliches (1990) pointed out, “Not all inventions are patentable, not all inventions are patented, and the inventions that are patented differ greatly in ‘quality’ in the magnitude of inventive output associated with them.” Furthermore, while $RNDGDP$ was certainly in there statistically speaking, we cannot discount the statistical significance of $MAGIC$ as well. The sort of institutions and
culture around patenting and innovation is not at all explained by R&D spending. Perhaps national governments should focus some of their attention on raising the “magic in the air”?
References


Table 1 Summary Statistics

Table 1 presents summary statistics of the variables used in this paper. N refers to country-year observations for 58 countries during the sample period 1980-2004. GDPPCGR: Annual Growth Rate in per capita Real GDP is the change in the natural logarithm of real per capita GDP. GCAPFORM: Gross private capital formation of a given sample year. GCONGDP: Government consumption to GDP is the expenses in a given year by the government to the GDP. EXPGDP: Exports to GDP are defined as the ratio of total exports to GDP. LITRATE: Literacy rate of the labor force (secondary education). FDIGDP: Foreign direct investment to GDP is the total FDI incoming to the country in a given year to the GDP. TECHINDEX: Technology index is an index developed from a number of variables: electric power consumption (kwh per capita), fixed line and mobile phone subscribers (per 1,000 people), personal computers (per 1,000 people), radios and telephone sets (per 1,000 people). RNDGDP: Total R&D to GDP is the total research and development expenditure at the country level to the GDP. TPATR: Total number of patent granted as a proportion to per million dollars of research and development expenditure. USAR: Ratio of patents granted in the USA as a proportion of total patent granted by the country in a given year. RESIDUAL is the residual from the regression estimate of the variable TPATR on RNDGDP.

<table>
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<tr>
<th>Variable</th>
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<th>SD</th>
<th>Min</th>
<th>Max</th>
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<td>0.06530</td>
<td>0.54450</td>
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<td>0.01550</td>
<td>5.08010</td>
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<td>0.09810</td>
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Table 2 Correlation Matrix

Table 2 presents correlation coefficients and the associated Bonferroni-adjusted significance levels of each correlation coefficients (in the parentheses). The definitions of the variables are same as in Table 1. * indicates significance levels of less than 5%.

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<td>8</td>
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<td>0.02832</td>
<td>0.04040</td>
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Table 3: OLS Regressions of real per capita GDP growth, annual data

Table 3 presents the OLS regressions of real per capita GDP growth based on the annual data at country level with White heteroskedastic-consistent standard errors. The dependent variable is real per capita GDP growth, and we include log of initial per capita real GDP, gross private capital formation, government consumption, and literacy rate as the base variables in the regressions. Definitions of variables are same as in Table 1. N refers to number of observations included in the estimation. Absolute values of t-statistics of the coefficients of the independent variables are reported in parentheses. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

<table>
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<tr>
<th>Model</th>
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<td>(0.91)</td>
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<td>0.16173***</td>
<td>0.16427***</td>
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<tr>
<td></td>
<td></td>
<td>(5.78)</td>
<td>(5.45)</td>
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<td>0.06283***</td>
<td>0.06890***</td>
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<td></td>
<td></td>
<td>(5.05)</td>
<td>(3.54)</td>
</tr>
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<td>0.02006</td>
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<tr>
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<td></td>
<td>(0.62)</td>
<td>(0.59)</td>
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<td>(0.91)</td>
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<td>(1.80)</td>
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<td>(2.86)</td>
<td>(2.95)</td>
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Table 3 (cont’d)

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<td>Adj R2</td>
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<tr>
<td>F-statistic</td>
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Table 4 presents the OLS regressions of real per capita GDP growth based on the three-year average at country level with White heteroskedastic-consistent standard errors. The dependent variable is the three-year (non-overlapping) average of real per capita GDP growth, and all independent variables are the initial year of the three year period. Definitions of variables are same as in Table 1. N refers to number of observations included in the estimation. Absolute values of t-statistics of the coefficients of the independent variables are reported in parentheses. *, **, *** indicate significance levels of 10%, 5%, and 1%, respectively.

<table>
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<tr>
<th></th>
<th>Combined Sample</th>
<th>High Income and Upper Middle Income Countries</th>
<th>Lower Middle Income and Low Income Countries</th>
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<td>(5.56)</td>
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<td>(1.18)</td>
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<td></td>
<td>(3.44)</td>
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<td>(3.23)</td>
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Table 4 (cont’d)

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<td><strong>Expenses – TPATR</strong></td>
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<td><strong>Proportion of Patent</strong></td>
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<td><strong>Granted in the USA</strong></td>
<td>(2.39)</td>
<td>(1.29)</td>
<td>(0.92)</td>
</tr>
<tr>
<td><strong>Residual of the</strong></td>
<td>3.96748</td>
<td>11.42539**</td>
<td>2.37844</td>
</tr>
<tr>
<td><strong>Estimation of TPATR on</strong></td>
<td>(1.40)</td>
<td>(1.98)</td>
<td>(0.73)</td>
</tr>
<tr>
<td><strong>R&amp;DGDP - MAGIC</strong></td>
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<tr>
<td><strong>Year Dummy</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td><strong>Country Dummy</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td><strong>N</strong></td>
<td>823</td>
<td>823</td>
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<td><strong>F-Statistics</strong></td>
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1.86896**: **1.730237**: **1.174008**: **0.26791**: **0.14254**: **0.22257**: **0.32863**: **0.23013**: **0.08970**: **3.96748**: **11.42539**: **2.37844**: **0.0486**: **0.0679**: **0.1089**: **0.1465**: **0.1384**: **0.0365**: **0.0544**: **0.0351**: **7.00**: **6.99**: **5.92**: **3.78**: **3.76**: **3.87**: **4.57**: **4.80**: **3.67**
Let me start by thanking the organizers for inviting me to the Fifth Colloquium and presenting me the opportunity to discuss this paper by Hasan et al on innovation and growth. This is an enjoyable piece of work, very thought inspiring and has the right appetite to dig very deep and very hard to get to what I think is the key empirical problem in this particular context of the relationship between innovation and growth, namely that of measuring the quantity and especially the quality of innovations and the innovation process in general. I also think that the authors take the effort to do serious panel data econometrics with a multitude of models, as is more or less standard in similar panel data exercises, and with a host of robustness test to cross check the sensitivity of the estimation results. However, after being safely carried through the empirical analysis, I came to the concluding comments and found, to my surprise, that the authors are very cautious in drawing definite conclusions from their analysis. This may be understandable, once it is recognized that, in effect, the authors have made the first pass with their model on the large international data set and that firmer conclusion will probably follow once further work on the specification and estimation of the models have been performed. In my comments, I will first walk through their analysis starting from the hypotheses to be tested on data followed by a very short description of the model(s) the authors take to the data and the methodology they use to estimate the model(s) to as well as the data itself. Finally, I say something about the conclusions.

There is a strong belief among the profession that successful innovation spurs economic growth. I cannot find particularly strong reasons to fight against this commonly held belief. I think it all start from entrepreneurs taking the necessary steps to innovate whenever
there is room for cost saving innovations or innovations that makes you different from your competitors. I will come to this point later. However, at this point it should be noted that not only the quantity of innovation, but also, and maybe even more importantly so, the quality of innovation is important for growth. This (theoretical) observation is well in line with the recent literature on the relationship between innovation and economic growth and, I would add, stands in equal footing with the idea that the quality of institutions is important for growth as continuously emphasized by the literature on endogenous growth. This is what Hasan et al. are after in their paper, where they set up their model so that they can test for the statistical and economic significance of the quality of innovations to economic growth on data that is carefully collected to make it possible for them to seek empirical evidence for the maintained hypothesis.

The authors do not introduce any formal economic model that explains the link from the quality of innovations to growth or that justifies the (form of the) empirical model that they estimate. Instead, they take a literature review and draw on existing literature to come up with estimable equations that incorporate, importantly, proxies for the quality of innovations as regressors. More specifically, these estimable models build heavily on growth equations of the Barro-Levine type.

These growth equations are then estimated on panel data consisting of country specific time series of GDP growth, proxies for the quality and quantity of innovations and a healthy number of control variables. Also, the initial level of the GDP is controlled for in the empirical analysis, which implies that the analysis also controls for catching up effects in the data. Estimations are performed using either annual or three year average growth rates of the GDP. The authors start with the OLS estimation, which is almost an industry standard nowadays. As usual, there is the possibility in dynamic panels that the OLS estimators are inconsistent so that alternative estimation methods should be entertained. The authors do so by running a set of alternative GMM estimators through the data. As a consequence a set of robustness checks is incorporated in the empirical analysis.

The authors use basically three sets of data. On the one hand, they use US patent data set, available from the NBER. Secondly, they collect GDP and other macro-data from the World Development Index
and lastly, they extract firm level R&D information from WorldScope database. The data covers 58 countries over the period 1980-2004.

As far as the estimation results are concerned the authors first point out that the unconditional correlations between GDP growth and the various r.h.s. variables of the empirical models are sometimes surprisingly low. However, both the quantity and quality of innovations fortunately come out as statistically (and economically) significant. Also, OLS and GMM estimation results agree on this. These results are robust to the measure of GDP growth, i.e. they survive using both annual and three year average GDP growth as the relevant growth measure. Finally the level of technology also seems important for growth as it comes out statistically significant.

So the result are very much in line with one's priors that the quantity and, in particular the quality of innovations matter for growth. However, looking closer at the estimation results, one observes that the R2s of the estimated models are extremely low. Of course, these statistics tend to be low very often when cross section data on individuals is a nontrivial part of the data set (58 cross section observations vs. 24 time series ones). But it suggests that a lot of the variation in the observed GDP growth rates remains unexplained by the alternative model that the authors estimate. Visually, this would come up starkly, if the authors could develop graphical tools to illustrate the goodness-of-fit of their models. Also, and this is my main point, patents are still very noisy measures of innovations, be it either quantity of quality of innovations, particularly from the point of view of growth. The underlying reason is that firms do a lot of hoarding when it comes to applying for patents for innovations. They hold a portfolio of patents wherefrom they try to seek the ones that are commercially the most successful ones. On the other hand, it is not entirely unrealistic to think that by hoarding patents or holding a portfolio of patents firms can build a technological buffer against their competitors and probably at the same time protect the core of their technological ideas that constitute the cutting edge of their business. The other side of the coin is, then, that maybe many, or even most of the patents actually never end up generating successful commercial activity or being used in production.

An aspect of the empirical model specifications that strikes me as surprising is that all of the estimated specifications are linear. Why
insist only on linear effects? Actually all of the analysis is not strictly speaking linear as the authors split the sample according to income levels to check whether they get different results in poorer and richer countries. Anyway, at more general and certainly intuitive level, some of the variables could in fact impinge upon growth in a nonlinear way, which, could be approach by including interaction terms as regressors to the r.h.s. of empirical model. Nonlinear or more specifically interaction effects may be particularly relevant when one thinks about the growth effects of innovation in different financial environments. Even though financial system share an increasing number of common features across countries, important differences remain. Furthermore, the quality and sophistication of the financial system, e.g. in a country, is also emphasized by the recent thinking, particularly by Aghion and Howitt\(^1\), on the relationship between innovation and growth. The implication of this to the present paper could be to try to incorporate measures of the quality of the financial system in the estimated growth equations.

A related point is that innovations may be necessary but not sufficient for growth. Recent research e.g. by Prescott and Parente\(^2\) has argued that good quality (policy) institutions combined with knowledge and innovations spur growth. Finally, there is the question of the causality between innovations and growth, an issue touched by the authors towards the end of their analysis. So, which way does it really go? Aghion’s recent writings may be relevant also at this point as he argues that the nature of innovation activity in firms depends on the distance of individual firms to the technological frontier. More specifically, firms further behind the frontier tend to imitate their technological superiors. Note that these firms or countries may turn out to be catching up countries, so that what we see in the data is that these firms are active innovators and grow rapidly. Once we approach the technological frontier, firms tend to innovate in order to escape competition from their rivals. This last point may be important, as some of the results not only in the paper, but also more generally, do suggest that the effects of the (quantity and quality of) measured innovations

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2 S. Parente and E. Prescott “Barriers to riches”, MIT Press 2000 pushes this argument most forcefully.
on growth tend to be smaller, even statistically insignificant in high income countries. It is firms wanting to escape competition – the idea of monopoly rents – and to stay on the frontier that explains innovations, which, in turn, sustains growth. Otherwise continuing with the existing technology compromises firms’ profits.

Anyway, this is an enjoyable paper. It should be read by everyone interested in growth economics.
Introduction

Let me first congratulate the organizers for putting together this interesting and important conference on Money, Derivatives, Innovation, and Growth and for inviting me to comment on the interesting and innovative paper authored by Hasan, Tucci, and Zazzara. On many levels, the subject matter of this paper is non-controversial in the sense that many in the economics profession including major policy institutions have converged on the notion that long-run economic growth depends on the creation and fostering of an environment that encourages innovation and the productive application of new technologies, especially new technologies of the general purpose variety that undergrid lasting and significant economic transformations. That innovative activity underpins economic productivity and growth can easily be seen, since a country’s real growth in gross domestic product can be approximated by the sum of the country’s labor force growth (or growth in hours worked) and labor productivity growth (or growth in output per hour worked). Both components of this relationship are impacted by innovation. Innovations such as third shifts and telecommuting can impact hours worked as can improvements in medical care since the growth rate of the labor force will be impacted. Regarding productivity growth, innovations and improvements in the quality of capital equipment and the capital stock more generally, worker education, management processes, and computing and information processing equipment are just a few of the ways that innovations can impact productivity growth. A natural corollary is that countries that generate innovation create new efficient productive technologies and encourage the adoption of these new technologies tend to grow faster than those that do not.

The literature on the determinants of real growth rates points to
numerous factors that explain, in part, why countries grow and prosper and the relationship between technology and economic growth has been captured in a vast number of formal models over the past 60 years or so. Early neoclassical models like Solow’s treated technological change as an exogenous variable, with long-run economic growth dependant only on exogenous technical change. Others generalized and added to the Solow model, endogenizing technology with concepts such as learning-by-doing, and showing that long-run economic growth critically depends on population growth. Other contributions related technology growth to some specification based on amount of labor resources devoted to the development to new technologies and ideas. More recently, models in the endogenous growth literature all tend to share the characteristic that a sustained increase in the amount of resources devoted to the creation of new technologies leads to continued increases in economic growth.

This relationship between the resources devoted to the creation of new technologies or innovation and economic growth is examined in the Hasan, Tucci, Zazzara paper. The added twist or innovation in the paper is that the authors also examine how the quality of innovations resulting from the expenditure of resources on developing new technologies impact economic growth. If one accepts the tenets of the extant endogenous growth literature (see Hasan, Tucci, and Zazzara for references), it would be expected that the more intense are a country’s expenditures on developing new technologies, the higher should be that country’s rate of economic growth. Correspondingly, the better the quality of the innovations generated by the higher expenditures on developing new technologies, the better should be economic growth. These are the hypotheses tested in the paper for a cross section of 58 countries over the period 1980 – 2003.

A Caveat Regarding the Relationship between Productivity Growth and Innovation

The view leading to the two hypotheses examined in the paper is well received, being the logical outcome of a tightly developed theoretical framework. However, I should point out that despite the attractiveness of this approach and framework, there is a contrasting relationship between the state of technology and productivity growth that has come
to be known as the productivity paradox or the great productivity slowdown—in reference to the slowdown in productivity growth that occurred during much of the postwar period. Although there are some explanations for the slowdown in productivity growth from the early 1950s to the early 1980s, it remains a puzzle as to why productivity growth slowed down in the advanced countries in the world despite significant increases in the state of technology.

I raise this issue only to alert the reader that despite the logical consistency and well developed hypotheses flowing from the endogenous growth literature, the time series evidence does not provide strong support for much of the theory for a large part of the post-war period. Fortunately, the Hasan, Tucci, Zazzara paper does not have to confront this paradox since the time span over which the hypotheses are tested is outside the slowdown or paradox period. Clearly, if the logic of the endogenous growth model is to hold, it certainly had better hold during the years following 1980 when we experienced unprecedented increases in productivity growth (especially in the developed economies of the world) lead by significant advances in technology and the application of new and existing technology—particularly as it relates to the use of information processing equipment (computers, telecom, the internet, etc.)—to all aspects of business including the way in which processes are organized and managed. Not only have we observed significant capital deepening and increases in labor quality since the early 1980s, we also have seen increases in multifactor productivity growth (commonly associated with innovations like new approaches to supply chain management, more efficient business management structures and processes, and the like) during this period.

The paper is successful in that the empirical results provide convincing support for the hypotheses outlined and tested by the authors and the endogenous growth model more generally. Hence, on this basis, the authors have made a positive contribution to the literature by providing answers to the important questions posed in the paper.

Some Issues, Comments and Suggestions for Future Research

As noted above, the authors are quite successful in their analysis and in establishing empirical support for their main hypotheses. Given this success, how might one provide constructive suggestions to the
authors for improving their analysis as they continue with this research program? In this regard, I would like to make several suggestions. First, from a philosophical viewpoint, I believe that it would be interesting to examine the relationship between economic well-being of the residents of a country and innovation using a broader measure of economic well-being than the real gross domestic product growth per capita. Second, I would like to suggest that more attention or thought be given to the variables used to measure the intensity of a country’s investment in innovation as well as the quality of these innovations. While the variables used to measure innovation intensity and the quality of innovation are reasonable (and novel in the case of the quality measure), they nevertheless could suffer from certain drawbacks as outlined below.

Measuring Economic Well-Being

What should be the dependent variable in so-called country growth regressions? As is the case for this paper, the literature typically uses real GDP growth per capita as the relevant measure of a country’s economic well-being or economic progress. This is understandable given that this measure is easily computed and is available for every country of interest. However, from a philosophical point of view, there may be better more comprehensive measures of a country’s economic progress or well-being. GDP is the sum of the money values of all final goods and services produced in the domestic economy during a given year. Thus, it does not include sales of intermediate goods and services, it only includes work done in the country, and only market activity is included. Clearly, since there are not well developed markets for environmental quality or health, these benefits are not included in the typical GDP measure. The same applies to other quality of life indicators such as life expectancy or education levels. There is ongoing work being conducted on developing better more comprehensive measures of economic well-being. For example, the UN’s Human Development Index (HDI) is one such index. This index combines GDP per capita with life expectancy at birth and with school enrollment measures to derive a broader measure of well-being. Other indexes are being developed with the same goal: to provide a more comprehensive measure of economic well-being. Hence, it would be interesting to see if the results of the paper continue to hold when such measures are used. Thus, I would encourage the authors to explore their hypotheses relating the intensity of innovation expenditure and the quality of the resulting
innovations using a broader measure of well-being.

_Measuring Innovation and Its Quality_

Turning to the key independent variables used in the paper—the ratio of research and development expenditures to GDP, total number of total patents granted, and the number of patents granted in the U.S.—I would also like to make a few observations and encourage the authors to continue to work on improving their measures of the amount and quality of innovations coming out of a given country.

The research process is a truly multidimensional process characterized by knowledge creation and involves activities and outcomes that are inherently difficult to measure. Despite this, expenditures on research and development are most often used as a measure of the input into the innovation generation process. Since research can involve basic research, applied research, and experiential development, it is difficult to draw a clear distinction between these concepts and even more difficult to know if and when each of these types of activities are actually included in the figures reported for research and development expenditures in a given company or country. Similarly, education and training that are critical to the success of an innovation but their expense are typically not included in research and development expenditures. Other examples of items that can be critical for the success of an innovation but may not appear as a research and development expense include market research, acquisition of complimentary products or licenses, product design, trial production, training and tooling up. The point here is that research and development intensity measures (like R&D/GDP) may be too narrow if they do not capture these type activities.

Another caveat that should be noted regarding the use of research and development intensity measures is the fact that R&D intensity in a country depends directly on the industrial mix of the country. Countries with high R&D intensive industries will naturally have higher aggregate R&D intensity measures. This would argue for controlling for the industrial mix present in the sample countries. Furthermore, low technology industries with low R&D intensities innovate none the less, so we really need a way to measure the technology that these firms acquire for innovation purposes (since they do not engage in direct research and development in the traditional sense). This is especially the case in service industries.
Patents (total number and number granted in the U.S) are also a key variable used in the empirical analysis in the paper. While the choice of patents as the key measure of a country’s innovation activity is well established in the literature (patent data is consistently reported across countries and over time), I nevertheless would like to encourage the authors to continue to refine their measure(s) of innovation. As useful as patents data are for measuring innovation quality, it must be remembered that patents are an indication of invention and not necessarily innovation. Patents mark the emergence of a new technical principle and not an economic or commercial innovation. As a byproduct of the legal process, many patents are intrinsically of little technological or economic significance. Hence, to use patents as the only indicator of innovation certainly misses the many non-patented inventions that actually lead to innovations that are of economic significance. In addition, some types of technology are not patentable but are crucial to the innovation activities associated of companies and there are thousands of patents that are never translated into viable products, processes, or innovations. Clearly, there is much room of the creation of more robust measures of innovation. Finally, the use of patents at the country or industry level can undoubtedly be obscured by the strategic behavior of firms. For example, many firms will not commercialize patents but may use them instead to prevent competitors from patenting ideas and using them.

Controlling for Other Factors in Growth Regressions

Several control variables are included in the growth regressions employed in the paper. These variables are important and appropriate. However, it might be interesting to introduce other control variables that typically do not appear in growth regressions but that might be important factors. The list of these other factors can be long, so I would only ask that in future extensions of this paper that the authors examine some of these variables (ruling out those that do not make for appropriate controls). A few of these potential variables include:

- the quality of the legal structure of the country and rule of law
- degree of patent protection
- independence of the central bank
- degree of financial deepening (presence of derivative markets and their liquidity)
- degree of corruption
• size and scope of the venture capital industry
• ease of starting small business

Conclusions

I conclude my comments by noting that authors have written a very nice paper that examines an interesting and important topic. The paper breaks new ground in its analysis of the impact of the quality of a country’s innovations on its real GDP growth rate per capita. The results of the paper should provide researchers in the field with the seeds for further inquiry into the relationship between a country’s economic growth rate as measured by real GDP per capita (or well-being) and the amount of resources that are spent in the country in the pursuit of innovation. Given the findings in the paper, the next step for the authors, in additional to improving the measures of innovation and its quality, is to discuss in detail some of the prescriptive public policy implications that are implied by the analysis. Surely, policy makers will likely embrace policy proposals that promise to improve the overall quality of life for their countrymen.
1. Introduction and summary

On January 1st 2008, after many years of preparation and simulation (5QIS), Basel II is due to become operational as the new international supervisory capital standard for banks. In Europe this will happen through the overall industry implementation of the CRD, to which the comments made in this paper refer.

Financial turmoils in the Summer 2007 show the merits of the general principles underlying the new international supervisory capital standards for financial intermediaries: measurement and management of overall portfolio risks and imposition of capital cushions to cover for unexpected losses.

However, market developments also revealed technical deficiencies and shortfalls of existing models, notably with reference to the central role of ratings as determinants of risk and hence of regulatory (and economic) capital.

The purpose of this note is two-fold. Firstly, through a highly stylized representation, it offers an analytic review of market disruptions. Secondly, it argues that the implementation process of Basel II should contain sufficient degrees of flexibility, to avoid the potential emergence of credit restraints as a consequence of adjustments which will have to be made to ensure the quality and soundness of the transposition.
After this introduction, the paper is structured in five paragraphs focused on the lessons to be drawn from market turmoil in terms of improvement in the current capital standard.

The first three sets of considerations are of technical nature and address deficiencies which have surfaced in the new capital standard paradigm. As will be clarified, the interaction between credit and liquidity risk is at the forefront of recent turbulences. More specifically, the distinction has to be drawn between monetary liquidity, market liquidity and funding liquidity risk. The modeling of these interactions, to assess economic and regulatory capital needs, requires careful new consideration.

The fourth argument - procyclicality of Basel II - is well known and has been thoroughly debated, but not necessarily satisfactorily settled, as will be argued mainly through a simulation exercise.

The four points can be summarized as follows:

(i) The rating of complex structured products, which was fundamentally assigned to the evaluation by credit agencies, has proved inadequate, and it is hardly possible to agree on a new sound approach in the very short-term.

(ii) The risk assessment of credits granted by banks to hedge funds/private equity funds was also questionable, notably as a result of the interposition of off-balance sheet instruments (SIV’s/conduits globally accounting in June 2006 for total assets of some $ 400 billion) which in many instances had now to be brought back to banks’ balance sheet.

(iii) More generally, the flow of funds from “capital” supervised intermediaries (banks, investment banks, insurance companies, financial conglomerates) to alternative asset managers/intermediaries (hedge, equity, sovereign funds) reveals a potential weakness in the financial stability architecture. Beyond the general agreement on the lack of inside, non standard, information on the most innovative sectors/processes of the financial system, the need for
transparency and some degree of supervision on the new intermediaries is especially clear as a result of the trend (temporarily stopped) for alternative asset managers to go public. This makes them automatically subject to securities supervision, and hence to transparency standards.

(iv) Many analysts and practitioners have drawn attention to the dangers of potential procyclicality of Basel II. This is another strong argument to enact the system with sufficient degrees of flexibility when the downside risks to the economy have definitely increased\(^1\), and at the same time the (necessary) recent rate cuts by central banks may raise inflation fears, with many commodities at multi-year highs.

Other concurrent considerations insist on the significant changes taking place in the analysis of rating models of Specialty Finance Providers and of banks actively involved in the structured subprime market (notably after the Northern Rock and Alliance ad Leicester episodes in the UK, Ikb in Germany and the American Home Mortgage and the NetBank cases in the US), and to the need to review deposit insurance schemes across countries.

More broadly, recent turmoils are also the result of the generalized stretching of leverage in the past few years. This process, too, revealed weakness in the Basel II standard which requires correction.

Low, or very low, interest rates, ample liquidity and very easy refinancing, good economic fundamentals and low rates of default (ref. slide I and II) lead to a sharp narrowing of credit spreads across asset classes. In spite of repeated warnings, the overriding attempt to maintain high yields prompted continuing increases in leverage, without paying attention to fundamentals of asset classes.

Financial engineering helped create new forms of leverage in world financial markets (eg. SCP, CDOs, CLOs, Conduits, SIVs, PM), well beyond the mortgage subprime sector in the US.

The Summer crisis in this segment, with perspective and actual

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\(^1\) See O’Neill (2007) and Rogoff (2007).
defaults had a tsunami effect on all leverage markets. The abrupt swing towards a strong decline in desired leverage, together with acute funding shortages led to massive sales, again quite independently of the fundamentals of the different asset classes. The pendulum swang in a few weeks from one extreme to the other in the global repricing of risk, with the overshooting typical of financial markets and with profound and lasting implications for regulated intermediaries, and their capital needs.

A brief section is therefore specifically devoted to examining ways and means to ensure appropriate symmetric flexibility to the capital standard during the transposition phase.

The following paragraphs address, in turn, the points previously made. The final section contains some concluding remarks.

2. The rating of complex structured products

Securitization and structured finance are perhaps the most innovative and fastest growing areas of global finance. They combine product, process and institutional innovation: derivatives, notably credit derivatives; banks’ on and off-balance sheet positions, SIV’s and conduits, equity and credit capital; specialty providers and hedge funds (Appendix).

These actors play a key role in the transfer of credit and liquidity risks. Recognition of the overall positive impact of these processes was accompanied by preoccupations, expressed also by international agencies, on certain features of the evolving system, which would have required corrective actions. A quote from a publication by the IMF in the Summer of 2005 is indicative: “Concerns have been raised that some market participants may not fully understand the risks in complex structured products. Observers are also questioning whether the structured products are transferring risks to the institutions best able to bear these risks or to the institutions that are least regulated.

...Because rating agencies derive substantial revenue from structured transactions and advisory services, participants questioned whether rating agencies were adequately managing potential conflict of interest”.

Let us briefly recall some key features of structured finance innovation which have revealed points of weakness in the Basel II risk-to-capital filters.

The new wave of synthetic (derivative) securitization in global finance is by no means circumscribed to the operation of specialty providers, and notably mortgage banks. The trend to market-based, securitized credit management strategies hinges on the gradual transition in operating models of large global banks, which shifted from buy-and-hold to originate-structure-warehouse-distribute balance sheet management.

Thus, in parallel to the adoption of the new accounting standards (IFRS), large complex global financial groups witnessed a rapid rise of fair-value assets, which now represent on average more than the 50% of total assets.

This clearly heightens their credit and liquidity risk volatility exposures, also because fair value is often, incorrectly, equated with market value, also in the presence of market failures.

The repackaging of cash flows transforms the risk, return, and liquidity features of portfolios. Typically, a bank would sell a loan portfolio to an off balance sheet special purpose vehicle (or a conduit, or a structured investment vehicle). The entity, in turn, would sell claims on the underlying portfolio, by repackaging processes.

The claims would be grouped into distinct tranches, with different risk and return features. They would typically range from AAA to sub investment grade and straight equity. Often the AAA part could account for some 60% of the issue, and equity for 10%.

Let us focus on a crucial further link of new structured finance: ABCP (asset backed commercial paper). Large banks are primary issuers of this paper, which is sold to sponsored conduits/vehicles together with an engagement to provide back-up liquidity. SIV’s also issue directly CP (ref. slide III and VI).

In July-August, when the preoccupations arose on the possible use of ABCP to finance mortgages, the refinancing of commercial paper became suddenly very difficult. The back up liquidity dried up and
many banks had to take conduits on balance, with a dramatic increase in liquidity and credit risks.

Specific mention must be made of leveraged loans and CLOs. Beyond the mortgage subprime market, also the market for leveraged loans was nearly blocked in August. Huge amounts of *de facto* frozen loans piled up in the balance sheets of international banks, whose capital requirements rose sharply.

We recall that the combined total of the leveraged loans markets on the two sides of the Atlantic amounts to some $1 trillion (ref. slide V).

Significant increases in the pipeline of new emissions are being recorded especially in the United States (ref. slide VI), where CLOs represent around 60% of the institutional market for leveraged loans. In September/October the market is gradually opening up again. Banks devalue (30%-40% credit enhancement), and package outstanding loans and sell them in tranches to the market.

Demand is coming back not only from hedge and sovereign funds, but also from institutional investors, for high ratings.

The first new important syndication was represented by the $26.4 billion loan granted in October to the private equity fund KKR to finance the buyout of FistDataCorp.

### 3. The new scenario of interactive credit and liquidity risks

Another important point that needs to be considered regarding the valuation of complex products under a stressed liquidity scenario refers to the heterogeneity of valuation approaches used. They can produce wide ranges of outcomes for more complex products. Under illiquid market conditions the discrepancies of such prices increase further, price information becomes less reliable and key assumptions and inputs to the models might not hold: the entire RAP approach becomes blurred.

“Mark-to-model” techniques, generally used by core banks (including hedge funds sponsored by banks) and their counterparties, may not have fully captured the potential losses embedded in some of the less liquid and more exotic positions in structured products like
CDOs. This uncertainty determined an evaporation of liquidity in the CDO secondary market. In turn, this heightened the uncertainty about the distribution and severity of subprime exposures throughout the structured credit market.

Model-based valuations exposed banks and their counterparties to basis risks in terms of hedging strategies. If, under stressed market conditions, there is mismatch between valuation estimates of an exposure’s true risk profile, hedging inefficiencies become relevant. These drawbacks determined significant and unanticipated hedge adjustments in illiquid markets. In cases where complex products themselves are used as hedges, a switch to more liquid but less effective hedges has, anyhow, exposed financial institutions to growing basis risks and related losses.

The complexity of assessing risk, valuation, and capital requirements of CDO’s has long been recognized (Duffie and Gârleanu, 2001). Gordy (2005) more recently drew attention to weaknesses of existing arrangements. These problems were apparently overcome by relying on rating agencies’ assessment and rating. The mentioned deficiencies of their approaches surfaced abruptly during the summer. In particular, risk mitigation offered by margins and collateral was far less than estimated through models.

We are speaking of a very large pool of assets: taken together ABS and MBS represent over one-third of the US debt market. Also in Europe issues in the securitized market in 2005-2006 were as high as €300-400 billion per year\(^3\).

Basel II introduces a risk sensitive treatment for banks’ securitisation exposures, whether the bank is an originator or an investor. In fact, under Basel I, there was a flat capital charge (8%) for securitization exposures, regardless of the risk. A regulatory incentive was thus created for banks to structure and distribute lower risk assets while retaining higher yield risk assets. The flat charge could severely understate the actual credit risk.

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\(^3\) Total losses on mortgage loans can be estimated in the region of $200 billion.
With reference to the backup liquidity lines that banks provide to sponsored or third party asset backed commercial paper (ABCP) conduits, there was typically no capital charge under Basel I, as these lines tend to have a maturity of less than one year.

However, the lessons coming from the recent turmoil suggest that there are areas of the Basel II framework that should be strengthened and adjusted. For example, the transparency on whether a risk transfer had occurred or which exposures are pulled back on to the balance sheet, is an important point to be analyzed. Many events risk weights should be reassessed in relation to the actual experience of the credit turmoil.

Recent events pose some important questions also in terms of the boundary between the trading book and the banking book. For example, a large number of banks purchased commercial paper issued by ABCP conduits that they sponsored in order to assist the rolling of the paper. Banks usually book the ABCP purchased in the trading book to exploit the relatively lower regulatory capital charge, even though it may not be possible to sell the paper in the market. An issue to be clarified is whether an instrument that cannot be sold in the market is eligible for inclusion in the trading book.

All these aspects require a significant reassessment of existing models (Pillar I), but also of Pillar II, notably in relation to the interaction of credit and liquidity/funding risks\(^4\) (ref. slide VII).

4. Banks’ credits to alternative asset managers: overall risk measures

In theory, and according to many risk models, credits provided by banks to hedge funds and private equity funds appeared relatively risk free. The risk, as was claimed, was ultimately born by sophisticated “qualified” investors in the funds, i.e. investors willing and best able to bear selected risks. The principle of *caveat emptor* would clearly apply,

\(^4\) It may be recalled here that detailed, quantitative warnings on possible negative interactions between credit and liquidity risks and of inadequacies of existing models to estimate default probabilities in the subprime market came for instance from Moody’s KMV: “Analyzing the subprime market fall out using EDF credit measurers”. April 2007.
and would additionally justify the very different supervisory regime, and also the lack of transparency of such funds.

Other broader geopolitical considerations may also have played a role in suggesting the apparent lack of active interest by supervisors in establishing a regime of transparency\(^5\).

As of August 2007, it may be estimated that the new pools of global money (alternative asset managers) comprised three main categories: beyond private equity ($1 trillion) and hedge funds ($2 trillion), sovereign wealth funds can be estimated to have more than $2.5 trillion assets under management.

It is however difficult to separate the different categories, also as a result of the close interactions between sovereign wealth and other segments of the market\(^6\). For instance, according to Chinese press reports, sovereign Chinese investors went into the sub prime mortgage market through the interposition of SIV’s, and important investments were made in the IPO of Blackstone.

As indicated, the listing of alternative asset managers created a supervisory problem: the opaqueness and the lack of knowledge of aggregate positions may be inconsistent with the requirements of public companies\(^7\).

In spite of their spectacular growth in terms of numbers and aum in the past decade\(^8\), hedge funds still account for a small share of

\(^5\) The need for greater transparency in respect of hedge funds' operations had been repeatedly stressed in the past. I take the liberty of recalling what I wrote on this subject in 2005: “A good example of overall improvement of market information is related to efforts to increase transparency of hedge funds. Reference can be made to Plusfunds, which calculates on the Bermuda Stock Exchange the net asset value, relevant risk measures, stress tests and concentration indices of listed hedge funds. This model should become an established norm”. (Masera 2005, p.125).


\(^7\) For an excellent analysis of problems and perspectives of the hedge fund industry see Flannery (2007).

\(^8\) Estimates of hedge funds growth are given in the table below.

<table>
<thead>
<tr>
<th>Hedge Funds Growth</th>
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<tbody>
<tr>
<td><strong>Years</strong></td>
</tr>
<tr>
<td>1990</td>
</tr>
<tr>
<td>2000</td>
</tr>
<tr>
<td>2006</td>
</tr>
<tr>
<td>2007 June</td>
</tr>
</tbody>
</table>
total aum. But they have a large (often over 50%) share in more risky financial markets, notably CDOs and lower-rated tranches of ABS.

Available information suggests that a vast majority of hedge funds operate with adequate capital cushions. This is predicated on the sound market principle of not being forced to sell desirable positions in a falling market. Practically all important hedge funds operate with average leverage below 90% of their maximum. Hence, the unwinding of speculative positions need not be immediate, with the risk of exacerbating market volatility.

Moreover, most loans made by broker dealer large banks to hedge funds are covered by adequate security arrangements, with variable margins imposed. However, the liquidity risks linked to collateral must not be neglected, with the possibility that the value of collateral falls short of requirements and counterparties need to provide additional marginal at relatively short notice. Recent events saw a loss of value in collateral, notably for hedge funds, that led to margin calls and sometimes an unwinding of positions and/or closure of the fund, which amplified pressures in markets.

These points may require further clarification.

Banks and investment banks interact with hedge funds in many ways, including prime brokerage relationships. The provision of services entails trading and execution, clearance and custody, technology. A critical part of the overall relationship is the extension of credit through: short term financing for leveraged positions, trading counterparty exposure, security lending, financing through margin loans and repurchase agreements. Contingent liquidity arrangements can also lead to counterparty credit risk.

As a result, CCRM (counterparty credit risk management) represents the principal line of defense between capital regulated intermediaries and alternative asset managers, notably hedge funds. Margining and collateral practices provide the main buffer to cover credit exposure.

The system appeared robust and well tested. But the summer
2007 experience showed unexpected deficiencies under severe stress.

More specifically, variation margins\(^9\) and initial margins\(^{10}\) should have ensured adequate collateral to cover not only the current replacement value of the contract loan in the case of counterparty default, but also the potential change in value in the contract between the time of default and the time at which the trading position can be liquidated.

The stress period of the Summer showed, however, that banks holding large exposures to hedge funds that defaulted, of anyhow, operated in markets where prices fell rapidly, reduced their credits also to credit worthy borrowers. The collateralization of credit exposure was not enough to mitigate the risk. The sudden decline in asset prices, triggered, for example, by the unwinding of a highly leveraged hedge fund, reduced value of collateral, or generated liquidity risk and further price declines via variation margins as investors sold into the falling market to meet margin calls. Such declines in collateral values, if sharp enough, casted doubts on the assumptions relied upon in stress testing and risk management and caused dealers to become more risk averse in their credit decisions.

This is consistent with academic research: according to the “financial accelerator” model popularized by Bernanke, Gertel and Gilchrist (1999) a fall in asset values may reduce collateral values and thus the ability of firms to borrow, which amplifies the impact of the initial shock. To the extent that bank-dependent borrowers cannot access alternative sources of funding, investment and economic activity will be curtailed until new relationships are formed, transparency is established and information recreated. These mechanisms identify an important avenue through which hedge funds can create systemic risk, i.e. by affecting the ability of regulated markets and intermediaries to provide efficiently credit to the real economy.

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9 Variation margin is the amount of collateral or cash offered to a dealer to cover past changes in the value of the counterparty's position (current exposure). If market price declines lead to a deterioration of the mark-to-market of a position, margin calls are triggered.
10 Initial margin is a specific amount of collateral designed to cover potential future changes in the value of the contract (potential future exposure).
Many important hedge funds are indeed suggesting that more transparency and better information would be in the interest of the industry. In any event, as was made clear in the above analysis, two issues should be addressed.

The first is a better separation between on and off balance sheet operations of banks, especially to discipline the possible risks of balance sheet capital requirements, as a result of contingent lending/liquidity commitments.

The second refers to a more transparent/common system of margining in respect of bank loans to hedge funds. Weaknesses of current arrangements contributed to the difficulties encountered in interbank markets. Precisely because of the opacity of the system, direct liquidity injections by central banks encounter difficulties, and can imply conflicts of interest.\(^\text{11}\)

5. Basel II and procyclicality

The issue of potential procyclicality of the Basel 2 capital standard is well-known and has been amply debated by the academic community, market operators and, evidently, supervisors themselves.\(^\text{12}\)

Three main areas have been identified as especially relevant for treatment under Pillar II:

(i) risks considered under Pillar I, but not fully captured by the process. These refer in particular to credit concentration risk, which can arise from:

- significant exposure to an individual counterparty or group of related counterparties;
- credit exposure to counterparties in the same economic sector and/or geographical region;
- credit exposure to counterparties whose financial

\(^{11}\) The LTCM affair was different, because it affected a single operator.

\(^{12}\) For a review of the literature and proposals to dampen cyclical features see Masera (2005) and (2006).
performance is dependent upon the same activity or commodity;
- indirect credit exposure arising from a bank’s active credit management activities, notably through derivatives and structured finance processes.

(ii) factors not taken into account by the Pillar I process (e.g. interest rate risk in the banking book, and business and strategic risk).

In particular, interest rate risks in the banking book covered under Pillar II include:

(iii) repricing risk between assets and liabilities;
- repricing risk between the hedge fund and the exposure;
- prepayment/early redemption risk.

(iv) factors external to the banks, notably business cycle effects.

A bank’s capital varies with business cycle; capital should be adequate to avoid shortfalls also under the stress of tests pertaining to adverse cyclical developments.

Stress scenarios are selected because, even if they have a very low probability of occurring (tail events) they often are illustration of the scale of disturbances that occur in extreme cases. This is one of the more general critique of VaR measurements\textsuperscript{13}.

The recent experience shows that the statistical and model frameworks currently available are inadequate to assess meaningfully certain types of stress scenarios, notably to cover for the interactions between sponsor banks, SIVs and hedge funds.

As indicated, SIVs and conduits typically fund themselves through the issue of short-term ABCP, and buy longer term risky securities. The maturity gap and the fear on the quality of notes issued by some SIVs

\textsuperscript{13} See Masera and Mazzoni (2007).
created a funding mismatch. This in turn may force SIVs to sell assets and thus prompt further declines in prices, which would ultimately hurt sponsor banks and thus require more capital.

This led, at the beginning of October, a group of large American banks (Citigroup, Bank of America and JP Morgan) to create a $75 billion debt fund to allay fears of a downward security price spiral.

Beyond the above considerations, which require specific attention, with a view to assessing variations of capital requirements over the cycle, a simulation exercise was undertaken on the basis of a large bank’s asset and liability structure.

More precisely the capital required was calculated for a bank’s credit portfolio under current Basel I rules from 1983 to 2006. Changes in the credit quality of the portfolio were calculated on the basis of Moody’s historical annual rating transitions.

Large swings were observed in capital requirements. For a bank following IRB methodology, capital need could change by more thank 50% (from 6.1 to 9.3% over a 5-year period - ref. slide VIII).

As indicated, the business cycle impact on capital is further amplified by the fact that the cost of raising capital is likely to increase in business downturns. A strong correlation (73%) of credit spread and rating downgrade to upgrade ratio established this fact.

In principle, capital markets and optional structures can be used as a way to dampen cyclical effects. In particular, contingent capital could augment a bank’s capital position during specific conditions\textsuperscript{14}. This could help address the issue of procyclicality (ref. slide IX).

However, under today’s highly perturbed market conditions, these schemes may be very difficult to operate. Additionally, supervisors themselves have to assess the full implications of contingent capital structures (ref. slide X).

\textsuperscript{14} Some $ 100 billion of lower-tier-two bank’s capital is estimated to be the hands of SIV’s, which may be forced to disinvest under current circumstances.
More generally, while it is very important to provide sufficient liquidity to the market under current circumstances, this cannot represent a lasting solution to prevent cyclical slowdowns.

This paper is strictly focused on the issue of Basel II implementation, but it cannot go without notice, that, in the eyes of many observers, including the author of this note, the lax monetary policies of the Fed between 2001 and the summer of 2004, the doubtful refinancing schemes in real estate (e.g. ninja and piggy-back loans) and the aggressive monetary and exchange rate policy of the Bank of Japan (e.g. carry trade) contributed to the real estate bubble, and the successive crisis\textsuperscript{15}.

The specific supervisory issue addressed in this note refers to the fact that, since July 2006, prices of residential real estate have been constantly falling in the US, with clear signs of excess supply in the market, without strong risk signals from existing capital standard models, and without preemptive measures being taken. This, no doubt, owed to the opaqueness and the complexity of the innovative financing processes described here.

6. Some suggestions for the transposition process

The need for flexibility in imposing capital requirements at the onset of Basel II has always been recognized, however, the primary concern of supervisors was centered on the fact that, especially with reference to advanced internal models, risk capital might result too low.

Paradoxically, this appeared the principal preoccupation of Rating Agencies.\textsuperscript{15} They argued (2006) that this would represent a major insufficiency of the Basel II regulatory approach: significant Basel II related declines in capital adequacy, especially with the application of advanced models by large banks, would have resulted in negative rating outlooks.

It should be observed that the preoccupation of weakening the

\textsuperscript{15} Unsustainable global imbalances are also the result of the pegging exchange arrangements of emerging currencies vis-à-vis the dollar, with the consequent huge increases in reserves, flowing to sovereign funds.
capital base with Basel II applied also to banks adopting standard models and prompted restrictive measures to be enacted with the onset of the new system.

As for the basic approach for operational risk, banks using the BIA must hold capital equal to the average, over the previous three years, of 15% of positive annual gross incomes. With regard to the standard approach to credit risk, past due loans for more than 90 days will be risk weighted similarly to default exposures. Additionally, it will become more difficult for banks to reduce the capital charge through collateral admitted by credit risk mitigation techniques.

Pillar II through ICAAP, SRP, and provisions for risks not treated under Pillar I, add-ons, capital floors, and also pillar III were instruments introduced to guard against this type of risk.

The arguments developed in this paper concur in underlying the need for adequate flexibility in the initial phase of operation of the new capital standard. The thrust of the analysis developed here shows, however, that, under current conditions, this flexibility should be allowed both ways, with the pendulum swinging towards possible ease.

As a consequence of market turmoils, and of the need to remedy restrictively technical deficiencies, a scenario of possible “excessive” capital requirement can also be envisaged. Corrective instruments should be available to cushions the emergence of undesired and unwarranted conditions of credit crunch.

It would clearly be unnecessary, and indeed inappropriate, to examine such measures in detail. This is evidently an area where the comparative advantage lies in the wisdom, experience and technical skills of supervisors.

I will therefore limit myself to sketch some simple hypotheses, from a principles’ point of view. The aim is to encourage the ability of regulators to agree transitional phased implementation of Basel II and of CRD, where sensible. In particular polarized positions (model recognition or refusal) should be, if possible, avoided in a situation where
advanced model require, as explained, significant changes/refinements.

To start with, symmetrical movements could be envisaged in terms of existing arrangements of add-ons and floors.

Symmetric filter techniques could also be introduced. More precisely, appropriate filters would lead, from a given overall risk position, to a capital absorption (Tier I and Tier II) which could be appropriately graduated up/down\(^\text{16}\).

Other measures could consist in giving the supervisory authorities the possibility, on a case by case basis, of shifting structured assets from the trading to the banking book. This would be restricted to situations when the difference between mark-to-market and mark-to-model becomes very high, as a consequence of market failures, i.e. to conditions where fair values are not expressed by market prices.

Finally, more flexible capital structures could be examined, and, eventually accepted by the supervisory authorities. As indicated, regulatory capital requirements under Basel II are dynamic and highly risk sensitive. As a result, the level of procyclicality of each bank will drive the volatility of its capital requirements.

Banks are expected to adopt a prudent approach to regulatory capital maintenance levels by holding a sufficient amount of regulatory capital to cover their most substantial loss over the previous 25-year period.

Additionally regulators will require banks to stress test their capital base against selected risks such as interest rate movements. Contingent capital could also be used to buffer such risks.

Under Basel II, unfavorable market conditions will cause a simultaneous increase in capital requirements, and potentially a decrease in Tier II issuance capacity. In other words, a fully leveraged capital structure will be hit hard as increasing capital requirements may not allow the bank to raise additional Tier II capital. In addition, raising incremental Tier I capital at this stage will be expensive and

\(^{16}\) A proposal along these lines was made by Gordy (2004). For an alternative scheme see Masera (2005).
probably less than straightforward.

Consequently, banks that are highly pro-cyclical (i.e. those with the most dynamic capital requirements) could take two measures to reduce the impact of this procyclicality.

Increase Tier I/Tier II ratio (subject to applicable regulatory limits) such that the Tier I capital (the loss absorbing capital cushion) is greater than under Basel I. Hold a percentage of Tier II capital in the form of Contingent Capital.

In this regard, to the extent that the overall quantum of Bank’s capital decrease under Basel II, an increase in the proportion of “Higher quality” Tier I to Tier II capital combination with a layer of Contingent Capital can also be seen as relatively conservative.

7. Conclusions

Through prompt action by central banks - notably the FED, the ECB and the BE - the structured finance crisis has been effectively managed. The risk of snowballing mutual negative interactions between the different operators/markets has been reduced, in spite of the opaqueness/lack of information/points of weakness which emerged in certain key areas.

The lack of reliability of credit ratings of structured products and the complexity in modeling, and assessing, the interplay of credit, liquidity and funding risks and collateral management represent a crucial feature of recent events, and require careful analysis.

The turbulence in financial markets subsides, but fragile conditions may well remain in the next few months.

The crisis in the US subprime mortgage market took place in a period when signs of weakness in US demand were already manifest, notably in housing, but also more generally: with US productivity growth falling, and with unit labour costs rising.

All these factors suggest that a “sensible regulation” approach
should be adopted in the critical phase of implementation of Basel II.

The risk sensitive regulatory capital standard is a very positive development for banks and benefits will extend to insurance companies as a result of Solvency II.

Enhanced risk management across global finance will be fostered, as the quality and robustness of intermediaries’ management systems, the efficacy of supervision, and improved rating processes by agencies will concur in creating a better overall environment.

However, a strict, rigid enforcement of Basel rules two months from now might undermine the huge work done, as a result of the considerations developed here. A period of flexible phasing in is therefore suggested. In this period, joint (supervisors and market players) work would permit to overcome the technical difficulties and deficiencies which clearly emerged in certain areas of the overall architectural design.

To resume the points made in this note, the rating driven approach of Basel II revealed weaknesses which should be promptly corrected. The areas of work can be declined according to three principal technical headings: stability, liquidity, counterparty risk, which can be separated for illustrative purposes, but are closely intertwined:

- Stability. Asset classes with the same rating can be characterized by highly different economic risk, as a consequence of the different stability of the rating itself.
  As has been indicated, an A-rated corporate loan and the A tranche of a CLO based on corporate loans have a different risk, mainly as a result of leverage inherent in the structured operation. This is especially true for the more complex structured credit products;

17 A more general problem should also be addressed. Current credit rating models, and the associated transition matrixes, are constructed on the basis of evidence extracted from a world where traditional banks (buy and hold) played a key role of delegated monitoring throughout the life of the loan. Are the estimated statistical models sufficiently robust in the new paradigm of originate and distribute? In other terms, do alternative asset managers create a discontinuity in the credit rating (PD & EL) processes?
• **Liquidity.** Asset classes with the same rating present different economic risk characters as function of their liquidity. While liquidity and funding risks should be modeled separately, for simplicity's sake we can define here liquidity as the gap between mark-to-market and mark-to-model. As has been shown, a clear lesson of the August crisis was the significant dislocation on super senior tranches. These created losses for intermediaries precisely because of the difference between m-to-ma and m-to-mo, and not because of a change in the true risk profile of the underlying. The same applies to SIV's notes.

• **Counterparty risk** towards unregulated “alternative” financial intermediaries. The issue here is whether, in order to capture correctly this risk, a distinction should be made with respect to capital regulated intermediaries, notably in the evaluation of collateral margins. As indicated, synthetic collateral structures model built and marked to model proved inadequate and undermined liquidity. Large spread-related losses spilled over to create credit-related losses with significant P&L repercussions. This destroyed confidence on the entire rating approach to SCP.

Finally, as a result of lasting effects of the Summer 2007 crisis, generalized shortages of bank capital may be expected by year-end and well into 2008. Thus, even excluding the onset of cyclical slowdowns, innovative and flexible capital markets solutions would have great advantages.

Access to capital markets in respect of Tier 1 and Tier 2, may be impaired / strained for a longer than expected period. More specifically, (i) hybrid capital is likely to be more costly than on average in the past, (ii) more assets will have to be shifted to the balance sheet, (iii) a backlog built up in the assumption, which is not likely to be verified, of a return to normality in terms of price / availability of capital. Finally, also as a result of IFRS accounting rules, (iv) it is more difficult for structured loans to be shifted from banking to trading books.

In sum, important areas of regulatory revision must be foreseen.
Overregulation would be counterproductive. What is advocated here is a cooperative effort by authorities and market operators to correct weakness according to a principle based approach.

The specific, operational, directions of the important work ahead have been indicated in this note, in particular:

- Rating determination mechanisms and rating stability should be critically reassessed and reformulated, notably to model the interactions between credit, liquidity and funding risks;

- Transparency standards should be improved, especially for some market participants; 18

- Leverage mechanisms should be reconsidered with a view to preventing excesses which surfaced in some cases, with adverse repercussions for the whole financial industry;

- More active, innovative and flexible capital management techniques should be examined and, to the appropriate degree, endorsed.

More generally, a satisfying, lasting solution to the above issues, and notably to the question of leverage, can hardly be reached without macroeconomic adjustments. Aggressive low interest rate and weak exchange-rate policies inevitably concur to high leverage and fuel financial bubbles.

18 The importance of overall transparency to protect the international financial architecture has been, in principle, recognized and stressed by the supervisory authorities. A quote by Alan Greenspan is illuminating: “Extensive efforts of recent years to bolster our international financial structure through enhanced regulatory supervision have too often proved ineffective. Fortunately, there are good reasons to believe that properly structured, the markets themselves can provide the self-correcting discipline that is so necessary to financial stability. However, for markets to perform this job, participants need to have information about counterparties and market leverage, for example, and this information must be relevant, timely, and accurate. A high level of transparency in the way domestic finance operates and is supervised is essential if investors are to make more-knowledgeable commitments and supervisors are to judge the soundness of such commitments by the financial institutions that they supervise” (Greenspan, 2000). However these statements of principle were not followed by any concrete steps.
There is also a clear need for a more integrated approach to capital regulation and supervision. The more and more mathematically sophisticated risk models must always be accompanied by the supervisors’ intimate understanding of the intermediary under control, which obviously requires full transparency and information, also on the links with non-capital supervised intermediaries.

Support should therefore be given, also at official level and notably by the FSF, to the changes recently proposed by the Hedge Fund Working Group (Hfwg) in London to improve transparency and information in the sector through a voluntary system.

As indicated, the principle is that of voluntary compliance, funds not adhering will have to “explain” their reasons to the market.

The measures envisaged foresee disclosure on: evaluation criteria, risk management systems, degree of leverage and unified codes of corporate governance. The final operational report should be out by January 2008.

The phasing-in period advocated here would thus be helpful also to improve market transparency, and to move towards a more open framework for the operation of global hedge funds. More generally, a flexible implementation is warranted to avoid risks of adverse procyclicality at a time when slowdown of growth may manifest itself (ref. slide XI) and signs and developing of a loosing credit downturn. Innovative capital market solutions which could have great advantages, also to cope with capital cyclicity may be difficult to implement in a very short term time horizon.

In sum, the suggestion made here is not to delay the overall regulatory process, rather to phase in flexibility a major component of the exercise, while more transparency and better understanding are achieved on key features of global financial intermediation.
Appendix

**Structured Finance and CDOs**

A Collateralized Debt Obligation (CDO) is a general term that refers to an investment-grade security backed by a portfolio of bonds, loans, mortgages or other assets.

A CDO is assimilated to an ABS instrument (Asset Backed Securities); i.e. a structured finance product where receivables from a designated asset portfolio (collateral) are securitized in order to create balance sheet liquidity.

In a CDO the collateral is represented by specific classes of assets: i.e. commercial, personal, leveraged loans CLO (Collateralized Loan Obligation), bonds CBO (Collateralized Bond Obligation), mortgages CMO (Collateralized Mortgage Obligation).

With such transactions a portfolio of assets is transferred from the balance sheet of the originator (sponsor) to a Special Purpose Vehicle (SPV) which refinances itself by issuing securities on this reference portfolio to capital markets (investors) at a margin. The proceeds of the offering are used by the SPV to pay the transferred portfolio of assets to the originator and to cover the costs associated with the execution of the transaction (fig.1).

In a CDO, securities are issued at two or more levels called tranches or tiers. Each tranche reflects a different degree of risk and rate of interest (usually tranches are divided between senior, junior or mezzanine and subordinated or equity). Both interest and losses are allotted according to investor seniority (i.e. senior tranche, like senior debt, has first claim on the collateral’s cash flows to cover its interest and principal payments. Junior tranche has second claim while the equity claims the residual).

Since their creation in the mid 80’s, CDOs have experienced a remarkable growth thanks to their particular appealing to both sponsor and investor, becoming today one of the key components of the structured
finance market.

From a sponsor point of view the issuance of CDOs is driven by the desire to: reduce regulatory capital requirements, lower the cost of funding, manage risk, increase lending capacity and diversify funding sources. On the other side, investors are attracted by CDOs for different reasons including participating in new asset types, capitalizing on market dislocations or transfer of credit risk.

Generally CDOs are divided in three major classes, depending on how they are structured, valued or managed: cash flow CDOs, synthetic CDOs and market value CDOs.

**Fig.1 Structure of a conventional collateralised debt obligation**

Cash flow CDOs are structured vehicles that issue different tranches of liabilities and use the net proceeds to purchase the pool of assets. The cash flows generated by the assets are then used to pay back investors in sequential order from the senior investor to the equity investor.
Also **Synthetic CDOs** are structured vehicles but in this case they use credit derivatives to achieve the same credit-risk transfer as cash flow CDOs, without physically transferring the assets. SPV issues notes to the investors and sells credit protection on a reference pool of credits. The money paid by the investors is then held by the SPV to either repay the investors or to pay the buyer of the credit protection, should an asset in the reference pool default. The credit-protection buyer pays a periodic premium to the SPV that, together with the interest earned on the money held by the SPV, is used to pay interest to the investors.

In a **Market value CDOs**, SPV issues liabilities based on an advance rate. This rate is specific to each asset and to each tranche of liability, and is based on historical price or return volatility for each asset type. The collateral is then marked-to-market on a periodic basis, and if the aggregate pool marks breach the pool advance rates, the collateral manager must sell collateral and pay down notes to bring the advance rates back in compliance.
**Glossary**

ACBP – asset-backed commercial paper
ABS – asset-backed security
BE – Bank of England
BIA – Basic Indicator Approach
CCRM – counterparty credit risk management
CDO – collateralised debt obligation
CLO – collateralised loan obligation
CMO – collateralized mortgage obligation
CP – commercial paper
CRD – capital requirements directive
ECB – European Central Bank
FED – Federal Reserve
FSF – Financial Stability Forum
GAAP – generally accepted accounting principles
HFWG – Hedge Fund Working Group
HY – high yield
ICAAP – Internal Capital Adequacy Assessment Process
IFRS – International Financial Reporting Standards
IMF – International Monetary Fund
IPO – initial public offer
IRB – internal rating based
LTCM – Long-Term Capital Management
MBS – mortgage-backed security
M-to-MA – mark to market
M-to-MO – mark to model
OAS – option adjusted spread
PD & EL – probability of default & expected loss
PM – prime brokerage
QIS – quantitative impact study
RAP – risk adjusted pricing
S&P – Standard and Poor’s
SCP – structured credit products
SIV – structured investment vehicles
SPV – special purpose vehicle
SRP – Supervisory Review Process
VaR – value-at-risk
References


Slide I - Global Aggregate - Corporate - OAS

Source: LehmanLive.com.

1 Option adjusted spread (OAS) is the flat spread over the treasury yield curve required to discount a mortgage-backed security's (MBS) volatile coupon payments to match its market price.

Slide II - Historic default rates - US: Corporate
1 Includes subprime mortgage loans. Prime (86%), subprime (14%); US mortgage debt outstanding ~ $10 trillion.
2 Includes leveraged loans.
3 Under stress, possible reversal of credits to on balances, mainly as a consequence of (i) contingent liquidity facilities to ABCP; (ii) equity and non investment grade tranches.
An ABCP (Asset Baked Commercial Paper) conduit typically a SPV that buys and holds a range of financial assets which are financed through the issuance of ABCP. Conduits are generally established by banks, acting as sponsors, and providing credit enhancement and liquidity support.
Slide V - Perspectives for the leveraged loan market

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<td>Perspective calendar</td>
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<tr>
<td>Months required to absorb arrears</td>
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<tr>
<td>% of market size</td>
<td>40%</td>
<td>10%</td>
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Source: Lehman Brothers and S&P’s LCD

Slide VI - Leveranged loans market pipeline in the US

![Chart showing the volume of CLOs and leveraged loans in issuance]  

Source: Lehman Brothers High Yield Syndicate, S&P LCD
1 Significant losses on first/second tranches of structured operations. Downgrading of all tranches. Unwinding and distressed sales? Defaults.
2 Liquidity pressures and solvency strains, inadequate collateral.
3 Liquidity pressures and counterparty solvency fears. Monetary base market liquidity does not flow to inter bank market. Generalised funding pressures also a result of involuntary on balance sheet accumulation of assets.
**Slide VIII - Capital Requirements Volatility: Example**

**Historical variations in capital imply it could potentially increase by 50% over five years period**

- An analysis conducted from 1983 to 2006 on capital requirement for a bank's credit portfolio under Basel II rules shows a substantial great volatility.
- Over the period of the analysis, for a bank following IFRS methodology, capital needs are changing by more than 50% (from 6% to 9%) and by 30% when compared to standardized banks.
- Capital is calculated each year based on the rating mix of the credit portfolio and the proportion of each rating in the portfolio is calculated based on the portfolio at the beginning of the year and the rating migration over the year.
- The volatility observed is further amplified due to the high positive correlation of credit spreads with business cycles, thus raising cost of capital in a business downturn.

![Historical Capital Volatility Graph]

**Methodology**

- To quantify historical volatility in the capital due to rating migration, we employ Moody's one year rating migration matrix from 1983 to 2006.
- For the purpose of the analysis, we assume following portfolio:
  - Average rating around BBB-
  - Average maturity of 3 years. 20% of the portfolio matures every year and is replaced by 5 year maturity credit with rating of BBB-
- Capital is calculated each year based on the rating mix of the credit portfolio, that is based on the portfolio at the beginning of the year and the rating migration over the year.

**Slide IX - Reducing Volatility by Optimizing the Capital Allocation**

Banks could hedge against the capital volatility during downswings both on the asset and liability side.

![Asset Side: Credit Portfolio Management]

**Optimal Capital Allocation**

- Basel II requires banks to hold regulatory capital to cover for unexpected losses; whilst equity tranches cover for most of the expected losses, the unexpected losses are mostly absorbed by the mezzanine part of the portfolio. Therefore, especially in a tight credit spread environment, the mezzanine tranche of the corporate loan portfolio is usually characterized by the lowest return on the regulatory capital.
- In order to reduce the capital requirement volatility, banks could buy mezzanine protection and simultaneously redeploy the capital generated to grow the lending volume either through organic growth or through acquisition of assets.
Slide X - Contingent Capital: Regulatory Rationale

Banks may want to hedge cyclical RWA movements with Contingent Capital

Due to the pro-cyclical nature of minimum regulatory capital requirements under Basel II, European banks may be required to raise Tier I capital at a time when investors will demand a significant new issue premium. Contingent Capital structures allow European Banks to lock-in Tier I capital in favourable market conditions.

Contingent Capital would be structured as a Lower Tier 2 instrument exchanged into a Tier 1 instrument upon the occurrence of certain events. This would allow the bank to lock-in Tier 1 spreads, at the expense of a slight premium on the Lower Tier 2.

The Contingent Capital could also be used as a cost effective way to meet rating agency requirements of a capital buffer vis-à-vis absolute levels of capital.

Slide XI - Potential effects of the credit crisis on global GDP

Global GDP evolution before and after the crisis