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ANALYSIS OF THE RELATIONSHIP BETWEEN INFLATION AND ECONOMIC GROWTH IN TURKEY

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ABSTRACT

The link between inflation (CPI) and economic growth (Real GDP) is the one of the main issues of macroeconomics. Many theoretical and empirical studies has discussed this topic. Therefore, this relationship in the economics literature investigate with different countries, period and empirical studies. There is no consensus on this relationship in empirical evidences. The main purpose of this study is to determine whether there is a causal relationship between inflation and economic growth in Turkey's economy between the period 2003:1-2015:4. To analyze this relationship we used Vector Autoregressive Model (VAR) and Granger causality test. Our findings indicate that there is one-directional causal link from economic growth to inflation. With this aspect of study is distinguished from conducted other studies for Turkey. Especially, within this period 2002 Emergency Action Plan which was put into practice after 2001 economic crisis and the contraction in the world economy caused a domestic-demand-based economic growth in Turkey. Hence, our findings are in accordance with these economic circumstances.

Keywords: Inflation, Economic Growth, Turkey, Vector Autoregressive Model (VAR), Granger Causality

JEL Classification: P44, O47, C32

TÜRKİYE'DE ENFLASYON VE EKONOMİK BÜYÜME İLİŞKİSİNİN ANALİZİ

ÖZET

Enflasyon ile ekonomik büyüme arasındaki ilişki makroekonominin temel çalışma alanlarından birini oluşturmaktadır. Bu iki değişkenin birbirleri üzerinde etkisi en çok tartışılan konular arasında yer almaktadır. Bu nedenle bu ilişki iktisat yazınında farklı ülkeler, dönemler ve ampirik çalışmalarla araştırılmaktadır. Söz konusu ilişkiyi test eden ampirik çalışmalarda ise bir fikir birliğinden bahsetmek mümkün görünmemektedir. Bu çalışmanın temel amacı Türkiye ekonomisinde 2003:1-2015:4 yılları arasında enflasyon (TÜFE) ve ekonomik büyüme (reel GSYİH) arasında bir ilişkinin var olup olmadığını belirlemektir. Bu amaçla çalışmada Vektör Otoregresif Model (VAR) ve Granger nedensellik testi uygulanmıştır. Ulaşılan sonuçlara göre enflasyon ile ekonomik büyüme arasındaki nedensellik ilişkisinde ekonomik büyümeden enflasyona doğru istatistiksel anlamlı ve tek yönlü nedensellik tespit edilmiştir. Bu yönüyle çalışma, Türkiye için yapılmış diğer çalışmalardan farklılıklar ortaya koymaktadır. Özellikle 2001 yılında yaşanan ulusal krizin ardından bir dizi yapısal reform sunan 2002 Acil Eylem Planı, dünya ekonomisinde yaşanan daralmalar, Türkiye'de iç talebe dayalı ekonomik büyümenin enflasyonu etkilemesi, sonuçlarla örtüşmektedir.

Anahtar Kelimeler : Enflasyon, Ekonomik Büyüme, Türkiye, Vektör Otoregresif Model (VAR), Granger Nedensellik

JEL Sınıflandırması : P44, O47, C32

1. GİRİŞ

Ne zaman ki ekonomik aktörlerin satın alma gücü değişti işte o zaman enflasyon ilgi odağı haline geldi. İktisadi düşünceler kapsamında da teoriler ekonomileri ekonomiler de teorileri şekillendirdi. Ekonomik gelişmeler yaşandıkça yeni kavramlar ve yeni olgular ortaya çıktı. Enflasyonda bu kapsamda önceleri zararsız bir olgu

olarak düşünülürken ve tabii ki buna yönelik teorik açıklamalar yapılırken –Klasik İktisadi Düşünce- derinleşen sonuçlarına çözüm bulunamayınca hatta göz ardı edilince –Keynesyen Yaklaşım- yeni teoriler ileri sürüldü – Neoklasik İktisadi Düşünce- teori ile uygulama arasında yaşanan bazen örtüşme bazen de çelişme süreçleri üzerinde özel inceleme gerektiren makroekonomik göstergelerin birbirleriyle etkileşimleri akademik çalışmaların konusunu oluşturdu. Bu çerçeveden bakıldığında çalışmanın ana konusunu oluşturan enflasyon ve ekonomik büyüme ilişkisi Türkiye özelinde ele alınmaktadır.

İkinci Dünya Savaşı'ndan sonra enflasyon ve ekonomik büyüme ilişkisi akademi camiasında merak edilen konular arasına girmiştir. Savaşın önce enflasyonun ekonomik büyüme üzerindeki etkilerinin pozitif nitelikte olduğuna dair çalışmalar çoğunlukta iken savaşın sonradan refah devleti uygulamaları ile birlikte ülkeler en güzel dönemlerini yaşamıştır. Keynesyen politikaların hakim olduğu bu dönemde Philips Eğrisi ile yüksek enflasyonun düşük oranlı bir işsizlik ile ekonomik büyüme üzerinde pozitif etkiler yarattığını ileri sürülmesi teorik açıdan da bir kanıt niteliği taşımaktaydı. 1950'li yıllarda ise yapısalcılar-pozitif etki- ve monetaristler-negatif etki- arasında uzun süren bir tartışma konusu olmuştur. 1970'li yıllara gelindiğinde ise petrol krizleri ile birlikte önü kesilemeyen enflasyon olgusu –hiperenflasyon- neticesinde enflasyonun büyümeyi negatif yönde etkilediğine dair araştırmalar artarak devam eder hale gelmiştir. Akademik çalışmalar arasında enflasyonla ekonomik büyüme arasındaki ilişkinin nötr olduğuna dair kanıtlar da mevcuttur. Bunun yanında eşik değer kabul edilen yöntemlerle de söz konusu ilişki irdelenmektedir. Söz konusu ilişkiye geniş çapta bakıldığında özellikle ampirik çalışmalarda bir fikir birliğinden bahsetmek mümkün değildir. Kanaatimizce bu durum ekonomilerin dinamik yapılarından kaynaklanmaktadır.

Enflasyonla ekonomik büyüme arasındaki ilişkiye geliştirmekte olan ülkeler açısından bakıldığında ise negatif ilişkinin yüksek seviyelerde seyreden enflasyonun ekonomik ortamda yarattığı belirsizlikler şeklinde ortaya çıktığını görmekteyiz. Bu durum fiyatlar ve uygulanacak ya da uygulanan politikalar arasında tutarsızlığa sebep olmaktadır.

Çalışmada ilk olarak enflasyon ile ekonomik büyüme arasındaki ilişkiyi tartışan farklı ekonomik teoriler ve literatür taramasına yer verilmiştir. Türkiye'de enflasyon ve ekonomik büyüme etkileşimi sorunsalına cevap arayan çalışmaya, veri ve yöntemlerin tanıtılması ile devam edilmiştir. Bulgular ve tartışma kısmını ise sonuç ve değerlendirme bölümü izlemiştir.

2. TEORİK ÇERÇEVE VE LİTERATÜR TARAMASI

Baumol'a göre ekonomik büyüme ve fiyat düzeyi arasında iki yönlü ilişki vardır. Yani ekonomik büyüme fiyat hareketlerini fiyat hareketleri de ekonomik büyümeyi etkilemektedir. Fiyat düzeyleri üzerinde ekonomik büyümenin etkisine bakıldığında; ekonomik büyüme fiyatlar üzerinde yukarı yönlü bir baskı oluşturmaktadır. İstihdam seviyesi yüksekken doğal kaynakların sahipleri fiyatlarını arttıracaktır. Sendikalar da daha yüksek ücret talep edeceklerdir. Artan üretim faktörlerinin fiyatları nihai ürün fiyatlarını da arttıracaktır. İş adamları da bu talepleri karşı koymayacaktır. Çünkü onların deneyimleri genişleme döneminde satışlarında ciddi bir etki yaratmadan fiyatlarını arttırmabileceklerini göstermektedir. Artan maliyetler daha yüksek bir gelire dolayısıyla da daha yüksek bir satın alma gücüne dönüşecektir. Ekonomik büyüme üzerindeki fiyatların etkisi; belli bir noktaya kadar yavaş yavaş yükselen fiyatlar ekonomik büyüme üzerinde uyarıcı bir etkiye sahiptir. Ekonomide iyimser bir atmosfer yaratarak ekonomik büyümeyi artırır (Baumol, 1958).

İktisat yazınında ekonomiler içerisinde ekonomik büyümenin nasıl sağlanacağı konusunda bir fikir birliği sağlanamamıştır. Klasik-neoklasik iktisadi düşünce ekonomik büyümeyi arz yönlü açıklarken Keynes-Post Keynesyen Yaklaşım ise talep yönlü açıklamaktadır. Neoklasik iktisatta sermaye birikimi, işgücü ve teknoloji temel belirleyiciyen tasarruflar yatırımları belirlemektedir. Bunlara ilaveten ekonomik büyümenin sağlanması için devlete düşen görevler açısından da farklı fikirler ileri sürmüştür. Neoklasiklerde Solow, sermaye birikimini dikkate alarak, devletin uygulayacağı politikaların büyüme üzerinde çok fazla bir etkide bulunamayacağını vurgulamıştır (Solow, 1956). Ancak yine neoklasik iktisadi görüş kapsamında değerlendirebileceğimiz içsel büyüme teorileri kapsamında devlet, büyümenin sağlanması noktasında aktif bir rol üstlenmektedir. Beşeri sermayenin, eğitimin, Ar-Ge'nin, teknolojinin ve bilgi birikiminin geliştirilmesi ile ekonomiler büyüme hızlarını arttırabilmektedir. Devletin bu konularda yapacağı aktif politikalarla arzu edilen büyüme oranının yakalanması sağlanacaktır (Romer, 1986; Lucas, 1988; Barro ve Sala-i-Martin, 1992). İçsel büyüme modelleri enflasyonu vergi

gibi kabul ettikleri için -sermayenin artan getirisi koşulu altında- enflasyonun ekonomik büyümeyi negatif yönde etkileyeceğini ileri sürmektedir.

Keynesyen ve Postkeynesyen Yaklaşımın ekonomik büyüme teorilerinde öne çıkan modeller Harrod-Domar ve Kaldor'un ileri sürdüğü modellerdir. Harrod (1939) ve Domar (1946) yaptıkları iki farklı çalışmada hemen hemen aynı sonuçları elde etmişler ve bu sonuçlar iktisat yazınına Harrod-Domar büyüme modeli olarak geçmiştir. Harrod (1939), hızlandırıcı prensibi ve çarpan teorisini oluşturan temel denge olarak gerekli ekonomik büyüme oranını; bireylerin ve tüzel kişilerin tasarruf etmeyi tercih ettikleri gelirlerinin bir bölümünün çıktının bir birim artış üretimi için gerekli olan sermaye mallarının değerine oranı olarak formüle etmektedir. Domar (1946), sermaye birikimi, yatırım ve istihdam arasındaki ilişkiyi inceleyen çalışmasında yatırımların firmalar ve tüm ekonomi için farklı anlamlara geldiğini belirtmektedir. Her iki kesim de yatırımları verimli alanlarda kullanırsa ekonomik büyüme gerçekleşecektir.

Kaldor'a göre ekonomik büyüme efektif talebe göre değil çıktının genel düzeyine göre belirlenen mevcut kaynaklara göre sağlanmaktadır. Teknolojik ilerleme verimliliği arttırmaktadır yani neoklasiklerin ileri sürdüğü gibi dışsal değildir. Kaldor'un modeli de diğer makroekonomik modeller gibi gelirin, sermayenin, karların, ücretlerin, yatırımların ve tasarrufların basit toplamlarından oluşmaktadır. Ekonomik büyüme sürecinde itici güç sermaye yatırımlarıdır. Para politikası pasiftir ve neoklasiklerin belirttiği teknolojik seçimler üzerinde sermayenin ve ücretlerin kar oranı etkili değildir (Kaldor, 1957).

Enflasyonun ekonomik büyüme üzerindeki etkisi makroekonomi içerisinde çalışmanın kapsamını oluşturan maliye politikasında incelenen temel konulardan biridir. Maliye politikasının ekonomik istikrarı sağlama amaçlarından biri olan fiyat istikrarını sağlama birçok ampirik çalışmaya konu olmuştur. Söz konusu bu çalışmalar incelendiğinde enflasyonun ekonomik büyüme üzerindeki etkisi ya nötr ya negatif ya da pozitif niteliktedir. Bunun yanında enflasyon oranına eşik değer verilerek enflasyon ve ekonomik büyüme ilişkisi test edilmektedir.

Sidrauski, Neoklasik büyüme modelinde olduğu gibi paranın nötr olduğunu hatta güçlü yansız olduğunu belirtmiştir. Sidrauski parasal büyüme modeline göre parasal genişleme oranlarındaki bir değişimin kısa ve uzun dönemde büyüme üzerindeki etkisini incelediği çalışmasında kısa dönemde parasal genişlemedeki bir değişimin sermaye birikimi oranında bir azalışa neden olurken uzun dönemde sermaye stokunda bir etkide bulunmamaktadır (Sidrauski, 1967a). Tasarruflar gelirin sabit bir fonksiyonu ve fiyatlar esnekken para stokundaki değişiklik nötrdür ancak parasal genişleme ya da para arzındaki değişiklikler süper nötrdür. Para stoku iki kat arttırılırsa fiyatlar da iki katına çıkar ancak ekonominin reel değişkenleri kısa ve uzun dönemde de değişmez (Sidrauski, 1967b).

Neoklasik ekonomik büyüme modellerinin çoğu parasal olmayan parayı bir servet unsuru olarak kabul etmeyen şekildedir yani bireylerin portföy tercihlerini dikkate almamaktadır. Bu noktadan hareketle Mundell-Tobin Etkisi olarak iktisat yazınına geçen ve enflasyonla ekonomik büyüme arasında pozitif ilişkinin olduğunu vurgulayan yaklaşıma göre, yüksek bir enflasyon oranı bireylerin parayı tasarruf etme ve elde tutma (değer saklama) maliyetlerini arttırmaktadır. Böylelikle bireyler yüksek enflasyon nedeniyle zorunlu tasarruf mekanizmasının harekete geçmesiyle birlikte sermaye birikimine karar verirler. Bu durum faiz oranlarını düşürerek ekonomik büyümeyi arttıracaktır. Klasik iktisadi düşünceye göre faiz oranları ve sermaye yoğunluğu, verimlilik ve tasarruf yani tasarruf eğilimi ve teknoloji etkileşimi tarafından belirlenmektedir. Kısa dönem için bu durumu kabul eden Tobin, Keynes'in de kısa dönemde faiz oranları ve sermaye birikimi üzerinde etkili olduğunu belirttiği parasal faktörlerin ve portföy kararlarının uzun dönemde de geçerli olduğunu belirtmiştir (Tobin, 1965). Mundell (1965), enflasyon ile ekonomik büyüme arasındaki ilişkiyi parasal faktörlerle açıklamıştır. Enflasyon oranı, parasal genişleme oranından ekonomik büyüme oranının çıkarılması sonucu belirlenmektedir. Yani enflasyon ile ekonomik büyüme arasında pozitif bir ilişki bulunmaktadır. Toplam talep-toplam arz sisteminde de enflasyon ve ekonomik büyüme arasındaki pozitif ilişkinin olduğu ispatsız olarak kabul edilmektedir (Gokal ve Hanif, 2004). Enflasyon ile ekonomik büyüme arasında pozitif ilişki olduğunu belirten bir diğer çalışmada Mallik ve Chowdhury'e (2001) aittir. Bangladeş, Hindistan, Pakistan ve Sri Lanka ülkelerinden oluşan örneklemeye göre ekonomik büyüme oranlarındaki değişimlere enflasyonun duyarlılığı, enflasyon oranlarındaki değişimlere ekonomik büyümenin duyarlılığından daha fazladır (Mallik ve Chowdhury, 2001). 1970'lerde stagflasyon olgusunun yaşanması söz konusu pozitif ilişkinin sorgulanmasına neden olmuştur.

Enflasyonla ekonomik büyüme arasında negatif ilişki olduğunu vurgulayan neoklasik iktisadın görüşlerini destekler nitelikte Barro (1995) doğurganlık oranı, eğitim, yatırımlar vb. gibi değişkenleri de dikkate alarak yaptığı çalışmada ekonomik büyüme üzerindeki enflasyonun etkisini regresyon denge modeli kurarak analiz etmiş ve enflasyon ile ekonomik büyüme arasındaki ilişkiyi negatif bulmuştur. Uzun dönemli yüksek bir enflasyon oranı ekonomik büyüme ve yatırımlar da azalışa neden olmaktadır. Enflasyon oranında yaşanabilecek yüzde 10'luk bir artış GSYİH'de yaklaşık yüzde 0.2 oranında bir azalışa yol açmaktadır. Barro, bu çalışmada neoklasik büyüme modelini genişletilmiş bir çerçeveye dayandırmaktadır. Tun Wai (1959), 1938-1950¹ yılları arasında Türkiye'nin içinde bulunduğu 31 kalkınmakta olan ülkeyi ele aldığı çalışmada Meksika haricindeki ülkelerin daha düşük enflasyon oranına sahip olduğu dönemlerde daha yüksek oranda kalkınma sağladıklarını ortaya çıkarmıştır.

Ekonomik büyüme üzerinde enflasyonun negatif etkisini 1961-1997 yılları arasında OECD ve APEC ülkelerinin verilerinden oluşan ampirik bir modelle açıklayan Gillman vd. (2002), teoride olduğu gibi OECD ülkeleri için enflasyon oranları yüzde 0-10 arası olan ülkelerde negatif bulmuştur. APEC ülkeleri için ise bu etki daha zayıftır (Gillman vd., 2002). Geçiş ekonomilerinde 1990-2003 yılları arasında büyüme üzerindeki enflasyonun etkisini Panel data veri analizi ile ölçen Gillman ve Harris (2010), ilişkiyi yine negatif bulmuştur.

Enflasyon ekonomik verimliliğe engel olduğu ölçüde ekonomi üzerinde negatif dışsallıklara da neden olmaktadır. Özellikle de enflasyon oranı uzun dönem boyunca yüksek oranda seyrederse ekonomide gelecekle ilgili belirsizliği ve bütçe açığını arttırmaktadır (Borrero, 2001; Gokal ve Hanif: 2004). Enflasyon; tüketim, tasarruf ve yatırım kararları üzerinde belirsizliği de arttırmaktadır.

Ekonomik büyüme üzerindeki enflasyonun doğrusal olmayan ve eşik değer etkisini araştıran çalışmalarda bulunmaktadır. Enflasyon oranı eşik değeri aşmadığı takdirde ekonomik büyümeyi pozitif eğer aşarsa negatif yönlü etkilemektedir. Doğrusal olmayan ilişkiyi ilk defa Fischer (1993) ileri sürmüş ve 1960-1989 yılları arasında 101 ülkenin verilerinden oluşan yatay kesit ve panel veri analizi sonucunda, enflasyon ve büyüme arasında negatif bir ilişki bulmuştur. Fischer'e göre makroekonomik politikaların temel göstergeleri enflasyon ve bütçe fazlası ya da açığıdır. Aynı zamanda ekonomik büyümeye vesile olan temel göstergelerden birincisi enflasyon ikincisi de bütçe fazlası ya da açığıdır. Hatta enflasyon oranı hükümetlerin ekonomiyi yönetme kabiliyetinin bir göstergesi olarak kabul edilmektedir.

Sarel (1996) 1970-1990 dönemleri arasında 87 ülkeyi incelediği çalışmada panel data sonuçlarına göre yüzde 8 enflasyon eşik değerini aşan ülkelerde enflasyonla ekonomik büyüme arasında negatif bir ilişki olduğunu belirtmektedir. Khan ve Senhadji (2001), gelişmiş ve gelişmekte olan ülkelere ilişkin 140 ülkeyi kapsayan ve 1960-98 yılları arasındaki verilerden oluşan doğrusal olmayan en küçük kareler yöntemine göre gelişmekte olan ülkelerde yüzde 1-3 ve gelişmiş ülkelerde yüzde 11-12 oranında bir eşik değer belirleyerek enflasyon ve ekonomik büyüme arasındaki ilişkiyi negatif bulmuştur. Diğer bir çalışma da Ghosh ve Phillips'e (1998) aittir. 145 ülkenin verilerinden oluşan ve 1960-1996 yılları arasında kapsayan çalışmada enflasyon oranının eşik değeri yüzde 2.5 oranında tahmin edilmiştir (Ghos ve Phillips, 1998). Bruno ve Easterly (1998), enflasyon ve ekonomik büyüme arasında uzun dönemde yatay kesit korelasyon olmadığını ancak enflasyon oranında yüzde 40'luk bir eşik değer aşırsa ilişkinin negatif olacağını belirtmiştir. Mubarik (2005), Pakistan için 1973-2000 yılları arasında kapsayan çalışmada enflasyonun eşik değer olan yüzde 9 oranını aşması durumunda ekonomik büyümenin kırmızı alarm verdiğini ve enflasyondan ekonomik büyümeye doğru negatif bir nedenselliğin olduğunu vurgulamaktadır. Ahmed ve Mortaza (2005) Bangladeş kapsamında yaptığı çalışmada uzun dönemde enflasyondan ekonomik büyümeye doğru negatif bir etkinin olduğunu belirtmektedir.

Enflasyon ile ekonomik büyüme arasında negatif ilişki olduğunu ileri süren ülke/ler bazında yapılan çalışmalar da bulunmaktadır. Faria ve Carneiro (2001) Brezilya için kısa dönemde negatif olan ilişkinin uzun dönemde pozitif olduğunu belirtmektedir. Sri Lanka ülkesi için uzun dönemde negatif olan ilişki Çin ve Hindistan için söz konusu değildir. Kısa dönemde ise sadece Çin için ilişki negatiftir (Jayathileke ve Rathnayake, 2013).

Bozkurt (2014), Türkiye için yaptığı çalışmada 1999.2 – 2012.2 yılları çeyreklik dönemler arasında koentegrasyon uygulama yöntemini kullanarak para, enflasyon ve büyüme arasındaki ilişkiyi incelemiştir.

¹ Veri yılları ülkeden ülkeye değişiklik göstermektedir. Enflasyonu yaşama maliyetlerindeki artış oranına göre hesaplamaktadır.

Türkiye’de uzun dönemde paranın dolaşım hızı ve para arzı (M2) enflasyonun temel belirleyicisidir. GSYİH’de yaşanan yüzde 1’lik bir düşüş doğrudan enflasyon oranında yüzde 1’lik bir düşüğe neden olmaktadır. Kirmanoğlu (2001), 1988.05-2000.12 dönemi için Türkiye’yi ele aldığı çalışmasında enflasyonun ekonomik büyümeyi ve yatırımları negatif etkilediğine yönelik sonuçlar elde etmiştir.

Türkiye için yapılan ampirik çalışmalar aşağıda Tablo 1’de özetlenmektedir.

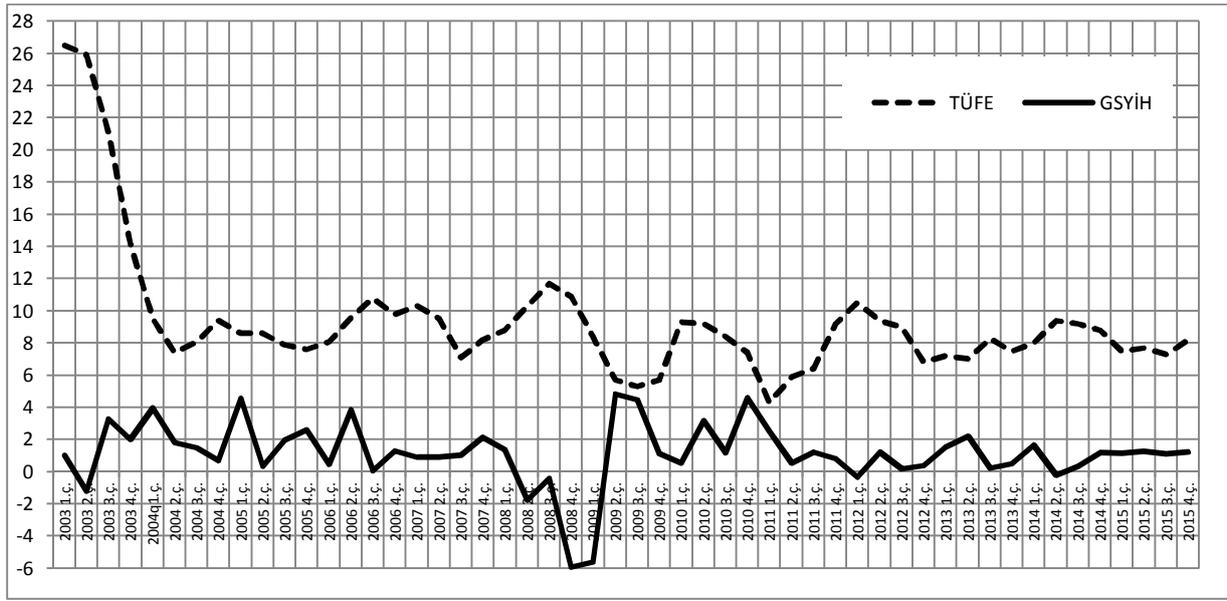
Tablo 1: Türkiye İçin Ampirik Çalışmalar

Yazar	Uygulama Alanı	Uygulama Yöntemi	Değişkenler	Bulgular
Karaçor vd. (2009)	Türkiye/1990 – 2005	Eşbütünleşme ve Nedensellik Analizi	GSYİH ve TEFE	Enflasyon ekonomik büyüme oranını negatif yönde etkilemektedir.
Karaçor vd. (2011)	Türkiye/1988:1 – 2007:4	Sınır Testi	Reel GSYİH, TÜFE ve Reel Gayri Safi Yatırım Harcamaları/Reel GSYİH	Kısa ve uzun dönemde ilişki negatiftir.
Turhan (2007)	1988:1-2005:4	Granger Nedensellik	TÜFE, GSYİH Deflatörü ve reel GSYİH	Nedensellik yok ve ilişki negatiftir. Enflasyon oranlarında yüzde 10’luk bir artış ekonomik büyümeyi yüzde 2.5 oranında azaltmaktadır.
Berber ve Artan (2004)	1987:1 – 2003:2	Granger Nedensellik	GSYİH, TÜFE ve TEFE	Enflasyondan ekonomik büyümeye doğru tek yönlü bir nedensellik söz konusudur. İlişki negatiftir yani enflasyon oranındaki yüzde 10’luk bir artış ekonomik büyümeyi yüzde 1.9 oranında düşürmektedir.
Terzi (2004)	1924 – 2002	Granger Nedensellik	GSMH ve TÜFE	Enflasyondan ekonomik büyümeye doğru tek yönlü ve negatif bir nedensellik söz konusudur.
Omay (2008)	1986:6 – 2007:1	VAR-GARCH yardımıyla Granger Nedensellik	TÜFE ve Sanayi Üretim Endeksi	Enflasyondan ekonomik büyümeye doğru tek yönlü ve negatif bir nedensellik söz konusudur. Merkez Bankası’nın fiyat istikrarını korumasına yönelik politika duruşu optimaldir.
Süleymanov ve Nadirov (2014)	2003:1 – 2013:4	Granger Nedensellik	GSYİH ve TÜFE	Büyümeden enflasyona doğru tek yönlü bir ilişki mevcuttur. Regresyon modeline göre negatif değerler elde edilmiştir. Ekonomik büyümede yaşanacak her 1 puanlık artış, enflasyon oranını 7.78 puan arttırmaktadır.
Esmen vd. (2012)	1968 – 2008	ARDL (Sınır Testi)	GSYİH, Nüfus Büyüme Oranı, Brüt Sermaye Brikiminin GSYİH’ya Oranı, Dış Açıklık ve TÜFE	İlişki katsayısı negatif 0.39 olarak düşük bir katsayı çıktığı için negatif bir ilişki olduğu söylenememektedir.
Artan (2008)	1987:1 – 2003:3	GARCH Analizi	GSYİH, Tüketici Eşya Fiyatları Endeksi ve Enflasyon Belirsizliği	Enflasyon belirsizliğinin enflasyona göre ekonomik büyüme üzerindeki negatif etkisi daha fazladır. Enflasyon oranındaki yüzde 1’lik bir artış büyümeyi yüzde 0.56 oranında azaltırken enflasyon belirsizliğindeki aynı orandaki bir artış ise ekonomik büyümeyi yüzde 3.95 oranında azaltmaktadır.
Türkecul (2007)	1988:1 – 2005:4	Granger Nedensellik	Tarım Sektörünün Büyüme Oranı, TÜFE ve TEFE	Enflasyondan ekonomik büyümeye doğru tek yönlü ve negatif bir nedensellik söz konusudur.
Akyazı ve Ekinci (2009)	1991:1-2007:12	Granger Nedensellik	Sanayi Üretim Endeksi ve TÜFE	Enflasyondan ekonomik büyümeye doğru tek yönlü ve negatif bir nedensellik söz konusudur.
Karaca (2003)	1987 – 2002	Granger Nedensellik	GSYİH ve TÜFE	Enflasyondan ekonomik büyümeye doğru tek yönlü ve negatif bir nedensellik söz konusudur. Enflasyondaki 1 birimlik artış ekonomik büyüme oranını 0.37 birim düşürmektedir.
Akgül ve Özdemir	2003:01-2009:12	İki-Rejimli TAR Modeli	Reel GSYİH ve TÜFE	Enflasyon oranında meydana gelecek bir değişim üç dönem öncesinden sinyal vermektedir. Enflasyonun ekonomik büyümeye etkisi enflasyon yüksek oranlarda ise negatif ve düşük oranlarda ise pozitifdir.
Uysal vd. (2008)	1950-2006	Granger Nedensellik	Enflasyon ve Büyüme	Enflasyondan ekonomik büyümeye doğru tek yönlü ve negatif bir nedensellik söz konusudur.

3. VERİ VE YÖNTEM

Çalışmada kullanılan veri seti OECD veri tabanından elde edilmiştir. Veriler, 2003:1-2015:4 yılları arasında TÜFE ve reel GSYİH serilerinden oluşmaktadır. Bu kapsamda aşağıdaki Grafik 1'in çalışmada yer alması önem arz etmektedir. Türkiye'de enflasyon ile ekonomik büyüme arasındaki betimsel ilişkinin gösterildiği Grafik 1 incelendiğinde, dönemler itibariyle uluslararası krizin yaşandığı dönem haricinde iki değişken arasında istikrarlı bir ilişkinin olduğu görülmektedir.

Grafik 1: Türkiye'de Enflasyon ve Büyüme (2003:1 – 2015:4)



Kaynak: OECD verilerinden tarafımızca hazırlanmıştır.

Enflasyon ve ekonomik büyüme arasındaki ilişkinin araştırılması amacıyla VAR ve Granger Nedensellik testleri yapılmıştır. VAR modeli ilk defa Sim's (1980) tarafından formüle edilmiştir. VAR modeli, yapısal eşanlı denklem modellerine uygulanan teorik kısıtlamalara karşı oluşturulmuştur. VAR modeli, seçilen bütün değişkenleri birlikte ele alır ve bir sistem bütünlüğü içinde inceler. Sıfır kısıtlama uygulanmaz. İçsel-dışsal değişken ayırımına yer verilmez. Tüm değişkenler içsel olarak kabul edilir. Belirli ve modeli yaratan katı bir ekonomik teorinin varlığı kabul edilemez. İktisadi teorinin ileri sürdüğü kısıtlamaların, varsayımlarını model tanımını bozmasına izin vermez. Değişkenler arasındaki ilişkilere hiçbir kısıtlama getirilmeden, değişkenlerin zaman içindeki davranışını çeşitli şoklara karşı dinamik tepkiler olarak formüle etmektedir. Tüm modelin hareketleri yapısal şokların değişkenler üzerindeki gecikmeli etkisiyle belirlenir (Yurdakul, 1999: 87-88; Özgen ve Güloğlu, 2004: 95).

İki değişkenli bir VAR modeli şu şekilde ifade edilebilir;

$$\begin{aligned} y_t &= a_1 + \sum_{i=1}^p b_{1i} y_{t-i} + \sum_{i=1}^p b_{2i} x_{t-i} + v_{1t} \\ x_t &= c_1 + \sum_{i=1}^p d_{1i} y_{t-i} + \sum_{i=1}^p d_{2i} x_{t-i} + v_{2t} \end{aligned} \quad (1)$$

Yukarıdaki modelde P gecikmelerin uzunluğunu, v ise ortalaması sıfır, kendi gecikmeli değerleriyle olan kovaryansları sıfır ve varyansları sabit, normal dağılıma sahip, rassal hata terimlerini göstermektedir.

VAR uygulaması için öncelikle iki değişkenin durağanlıklarının birim kök ile test edilmesi, gecikme uzunluklarının belirlenmesi, otokorelasyon, değişen varyans ve istikrar koşulu gibi varsayımların yapılması, etki-tepki fonksiyonları ve varyans ayrıştırılmalarının yapılması gerekmektedir.

Çalışmada değişkenlere ait zaman serilerinin durağanlık testi, Genişletilmiş Dickey-Fuller (ADF) ve Phillips-Perron (PP) testleri ile yapılmıştır. ADF ve PP testleri zaman serilerinin durağanlık özelliklerini açıklamak için kullanılmaktadır. Verilerin durağanlığının belirlenmesi istatistik açıdan doğru sonuçlar elde edilmesini

sağlamaktadır. Zaman serilerinin durağan olması; zaman ile değişkenler arasındaki ilişkinin bağımsız olması anlamına gelmektedir. ADF testi regresyonu aşağıdaki gibi gösterilmektedir (Gujarati, 2004: 817):

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad (2)$$

Δ birinci fark işlemcisi, t zaman trendi, ε_t hata terimi, Y_t kullanılan seriler ve N ise bağımlı değişkenin gecikme sayısını ifade etmektedir. PP yaklaşımı ise gecikmeli fark terimleri eklemeyen hata terimleri seri korelasyona özen göstererek parametrik olmayan bir düzeltme kullanmaktadır.

Çalışmanın bundan sonraki bölümünde enflasyon ve ekonomik büyüme logaritmik olarak ele alınacaktır ve sırasıyla lnCPI ve lnGDP şeklinde isimlendirilecektir. Bu değişkenlere ilişkin tanımlayıcı istatistikler Tablo 2’de gösterilmektedir.

Tablo 2: Enflasyon Verilerinin Tanımlayıcı İstatistikleri

İstatistikler/Değişkenler	lnGDP	lnCPI
Mean	17.068	4.514
Minimum	16.631	3.989
Maximum	17.368	5.014
Standard Deviation	0.176	0.301
Skewness	-0.432	-0.069
Kurtosis	2.527	1.825
Jarque-Bera	2.103	3.033

4. BULGULAR VE TARTIŞMA

Modelde kullanılan iki değişkenin ADF ve PP birim kök testlerine göre durağanlıkları Tablo 3’te yer almaktadır.

Tablo 3: Birim Kök Testi Sonuçları

	Genişletilmiş Dickey-Fuller Test Sonuçları			
	Düzye		Birinci Fark	
	Sabitli	Sabit ve Trendli	Sabitli	Sabit ve Trendli
lnCPI	-0.9456	-2.6469	-6.2820***	-6.5092***
lnGDP	-1.5679	-3.1348	-5.7652***	-5.7942***
	Phillips-Perron Test Sonuçları			
	Düzye		Birinci Fark	
	Sabitli	Sabit ve Trendli	Sabitli	Sabit ve Trendli
lnCPI	-1.7827	-2.4711	-7.7967***	-8.1060***
lnGDP	-1.5679	-2.6345	-5.7736***	-5.8089***

Not: Mac Kinnon*, **, *** sırasıyla %1, %5 ve %10 kritik değerlerini göstermektedir.

Tablo 3’te ADF ve PP test sonuçları yer almaktadır. Her iki test sonucuna göre de lnCPI ve lnGDP serileri hem sabitli ve hem de sabitli ve trendli modellerde durağan olmadığı sonucuna ulaşılmıştır. Serilerin birinci farkları alındığında her iki serinin de birinci dereceden durağan oldukları kabul edilmiştir. Bundan sonraki aşamada değişkenler arasında uzun dönem ilişkinin test edilmesi gerekmektedir. Bunun için Engle ve Granger (1987) ve Phillips ve Ouliaris (1990) eşbütünleşme testleri uygulanmıştır.

Tablo 4: Eşbütünleşme Test Sonuçları

Test	Olasılık Değeri	Kritik Değerler		
		%1	%5	%10
E-G Test	-3.426	-3.9618	-3.3654	-3.0657
PO_Zt	-5.935	-3.9618	-3.3654	-3.0657
PA_Za	-42.621	-28.3218	-20.4935	-17.0390

*Testlerin kritik değerleri Phillips-Ouliaris (1990) çalışmasındaki Tablo 1a ve Tablo 1b'den elde edilmiştir.

Tablo 4'ten görüleceği gibi Engle-Granger testine göre %5, Phillips-Ouliaris testine göre ise %1 düzeyinde değişkenler arasında eşbütünleşme olduğu boş hipotezi reddedilmektedir. Dolayısıyla bundan sonra VAR modeli tahmini için öncelikle gecikme uzunluğunun belirlenmesi gerekmektedir.

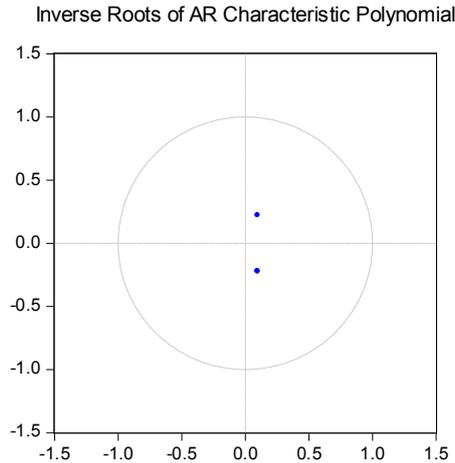
Tablo 5: VAR Gecikme Uzunluğunun Belirlenmesi

Gecikme Uzunluğu	AIC	SC	HQ
0	-11.5362	-11.3787*	-11.4769
1	-11.6085*	-11.2935	-11.4900*
2	-11.5810	-11.1086	-11.4032
3	-11.5091	-10.8792	-11.2721
4	-11.5327	-10.7554	-11.2364

* İlgili kritere göre belirlenen optimal gecikme uzunluğudur.

VAR modelinin gecikme uzunluğunun belirlenmesi için kullanılan en yaygın istatistikler Akaike Bilgi Kriteri (Akeike Information Criterion-AIC), Schwarz Bilgi Kriteri (Schwarz Information Criterion) ve Hannan-Quin Bilgi Kriteri (Hannan-Quin Information Criterion-HQ)'dir. Bu bilgi kriterlerini minimum yapan gecikme uzunluğu optimal olarak kabul edilir. Bu çalışmada VAR modeli için optimal gecikme uzunluğu AIC ve HQ bilgi kriterlerine dayanarak 1 olarak belirlenmiştir.

VAR modelinin geçerliğini sınamak için ilk bakılması gereken kararlılık koşulunun sağlanıp sağlanmadığıdır. Aşağıdaki Şekil 1 incelendiğinde VAR modelinin kökleri daire grafiğinin dışına çıkmadığından kararlılık koşulunun sağlandığı söylenebilir.

Şekil 1: Karakteristik Kökler

Bundan sonraki aşamada modelde otokorelasyon sorunu olup olmadığı Lagrange Çarpmanı (LM) Testi ile sınanmıştır. Tablo 6'ya göre 4. mertebeye kadar yapılan otokorelasyon sınaması sonuçlarının tümünde otokorelasyonun olmadığı boş hipotezi kabul edilmektedir.

Tablo 6: LM Otokorelasyon Test Sonuçları

Gecikme Uzunluğu	LM İstatistiği	Olasılık
1	4.5553	0.3360
2	5.7768	0.2164
3	2.8671	0.5803
4	5.5851	0.2323

Tablo 7’de ise değişen varyans test sonuçları gösterilmektedir. Buna göre White değişen varyans test sonuçlarında değişen varyansın olmadığı boş hipotezi kabul edilmektedir.

Tablo 7: WHITE Değişen Varyans Testi Sonuçları

Chi-sq	dg	Olasılık
28.0142	24	0.2594

Tablo 8’de varyans ayrıştırması sonuçları gösterilmektedir. Çalışmada varyans ayrıştırması gerçekleştirilirken, “Cholesky Decomposition” temelli olması nedeniyle E-views programı kullanılmamıştır. Çünkü “Cholesky Decomposition” yöntemi varyans ayrıştırmasında da değişkenlerin sıralamasından etkilenmektedir. Çalışmada yer alan varyans ayrıştırması, değişkenlerin sıralamasından etkilenmeyen “Generalized Impulses” yöntemine göre, tarafımızca hazırlanmıştır.

Tablo 8: Varyans Ayrıştırması

lnGDP		lnCPI	
lnGDP	lnCPI	lnGDP	lnCPI
100	0	0.004967	99.99503
99.94869	0.051305	0.31306	99.68694
99.92827	0.071727	0.441645	99.55835
99.91788	0.082124	0.508415	99.49158
99.91157	0.088429	0.549356	99.45064
99.90734	0.092657	0.577002	99.423
99.90431	0.095689	0.596923	99.40308
99.90203	0.09797	0.611961	99.38804
99.90025	0.099747	0.623715	99.37629
99.89883	0.101172	0.633154	99.36685

Tablo 8 incelendiğinde GDP ve CPI’nin nedenlerinin tamamına yakını kendileridir. İlerleyen dönemler ele alındığında yine etkinin aynı şekilde devam ettiği görülmektedir.

Varyans ayrıştırmasından sonra değişkenlerin birbirlerinin nedeni olup olmadığını test etmek amacıyla Granger nedensellik testi uygulanmaktadır. Granger, 1969 yılında nedensellik ve dışsallık kavramlarını ilk defa ileri sürmüştür (Granger, 1969). Eğer x değişkenine ait bilginin modele eklenmesi, ait bilginin modele eklenmesi, y değişkeninin öngörüsüne yardımcı oluyorsa, x değişkeni y ’nin nedenidir. Eğer H_1 ve H_2 hipotezlerinin her ikisi de reddedilirse, x ve y arasında iki taraflı bir nedensellik olduğu anlaşılmaktadır (Özgen ve Güloğlu, 2004: 96-97).

Tablo 9’da nedensellik testi sonuçları gösterilmektedir.

Tablo 9: Nedensellik Testi Sonuçları

	Chi-sq	df	Olasılık
Bağımsız Değişken: lnGDP lnCPI	1.748910	1	0.1860
Bağımsız Değişken: lnCPI lnGDP	3.655614	1	0.0559

Tablo 9’a göre olasılık değerleri göz önüne alındığında yüzde 10 anlamlılık seviyesinde enflasyon ile ekonomik büyüme arasındaki nedensellik ilişkisinde ekonomik büyümeden enflasyona doğru tek yönlü nedensellik tespit edilmiştir. Çalışmadan elde edilen bulgulara göre bu çalışma, Süleymanov ve Nadirov (2014) çalışmasının

sonuçları hariç olmak üzere enflasyondan ekonomik büyümeye doğru bir ilişkinin olduğuna yönelik diğer çalışmalardan ayrılmaktadır.

5. SONUÇ

Makroekonomik politika uygulayıcılarının en temel hedeflerinden biri düşük enflasyonlu istikrarlı bir ekonomik büyüme hedefidir. Akademik çalışmalarla da desteklenen bu görüşü gerçekleştirmek uzun dönemli bir amaç niteliğindedir. Kısa dönemde özellikle Türkiye gibi yükselen ekonomiler içinde yer alan ülkeler açısından bu dengenin sağlanması yapısal özelliklerinden dolayı kırılgan bir durum sergilemektedir. Bunun yanında uzun dönemli bir hedefe ulaşılması için ise birçok yapısal reformların gerçekleştirilmesi gerekmektedir.

Türkiye ekonomisinde 2003:1-2015:4 dönemi enflasyon ve ekonomik büyüme arasındaki nedensel ilişkinin araştırıldığı çalışmada, ekonomik büyümeden enflasyona doğru istatistiksel yönden anlamlı ve tek yönlü bir ilişkinin olduğu belirlenmiştir. Bu yönüyle Türkiye için yapılmış diğer çalışmalardan farklılıklar ortaya koyan çalışmada, özellikle 2001 yılında yaşanan ulusal krizin ardından bir dizi yapısal reform sunan 2002 Acil Eylem Planı'nın ardından uygulanan politikaların ve dünya ekonomisinde yaşanan daralmaların özellikle de Türkiye'de iç talep destekli ekonomik büyümenin enflasyonu etkilemesi sonuçlarla örtüşmektedir.

Türkiye'nin 2003-2015 yıllarını kapsayan ekonomik durumunu, üçer aylık reel GSYİH ve TÜFE verileriyle betimsel analize dâhil ettiğimiz Grafik 1 incelendiğinde genel olarak istikrara yakın bir görünüm karşımıza çıkmaktadır. Bu yıllara kadar kamu destekli büyüme politikası ve uygulamada gecikme yaşanan anti-konjonktür politikalar, ekonominin uluslararası finansman ihtiyacını arttırmıştır. Büyük ölçüde bütçeden karşılanan kamu yatırımları, bütçe açıklarına neden olmuştur. Döviz kurundaki dalgalanmalar, kamu kesimi borçlanma gereğini hızla arttırmış ve dış borçlanma ön plana çıkmıştır.

Sürdürülemez olan dış borçlar ve ekonomik istikrarsızlıklar, siyasi istikrarsızlıklarla desteklenmiş ve 1998'de yaşanan uluslararası kriz, 1999 İstanbul depremi Türkiye ekonomisinin bir kez daha krize girmesine neden olmuştur. Tekrar uygulamaya konulan istikrar politikaları ile durum 2001 yılına kadar sürdürülebilmştir. Uygulanan yanlış ve gecikmeli maliye politikaları; bağımsız para politikası ve sermaye hareketi karşısında uygulanan bant içinde dalgalı kur rejiminden vazgeçilmek zorunda kalınması 2001 krizini tetiklemiştir. 2001 sonrası dış borçlanma yerine iç borçlanmaya önem verilmiş, özel sektörün ve hanehalkının borçlarında artış meydana gelmiştir. Bütçe açığı düşmüş, cari açık artmıştır. Tasarrufların azalması, efektif talepte meydana gelen azalışlar enflasyonun düşmesini sağlamıştır.

Çalışmada analize konu olan 2003 yılında başlayan istikrar politikası ile bir önceki istikrar politikası desteklenmiş ve uygulanması mali disiplin temel alınarak güçlendirilmiştir. Temel olarak enflasyon çıpa olarak gösterilmiş, amaç ise en kısa sürede tek haneli rakamları yakalamak olarak belirtilmiştir. Büyüme ise düşük faizli krediler ile iç talep destekli ve ihracata dayalı olarak gerçekleştirilmeye çalışılmıştır. Uluslararası krediler ile desteklenen düzenlemeler, bankacılık sektörü düzenlemeleri ve kamu yönetiminde yeni yasaların uygulanmasıyla, kamu tasarrufları ve vergi gelirleri arttırılmaya çalışılmıştır. Bu durum bütçesel yükü azaltmış, toplam kamu borcunda düşüş sağlamıştır.

Özel sektöre sağlanan teşvik ve ucuz kredi imkanları, özel sektörün ve hanehalkının tüketimlerini arttırmış, tasarruf oranlarında düşüşe neden olmuştur. Büyümenin temelini teşkil edecek olan özel sektörün yatırımlarındaki ve üretimindeki artış, büyüme üzerinde etkili olamamıştır. Yurtiçi ve yurtdışında yaşanan olumsuzlukların etkisi, döviz kuru ve dolayısıyla ihracata dayalı büyüme üzerinde olumsuzluklara neden olmuş, ihracat içindeki ithal malların maliyetlerinde artışa neden olmuştur. Bütçe disiplini sağlanmış ancak özel sektörün ve hanehalkının borçlanmalarında artış meydana gelmiştir. Üretim ile desteklenemeyen bireysel harcamalar, iç talep olarak büyümeyi belli bir seviyede tutmuş ancak enflasyonun istenilen seviyeye inmesini de engellemiştir.

2008 yılında yaşanan uluslararası finansal krizin olumsuz etkisi, ihracata dayalı büyüme stratejisi izleyen Türkiye ekonomisini bir sonraki yıl ortadan kalkmış, iç talebin desteğiyle büyüme oranında artış sağlanmış, arz fazlalığı sebebiyle ise enflasyon oranında düşüş oluşmuştur.

Enflasyonun tek haneli rakamlara düşmesi, büyüme oranında yaklaşık yüzde 4'lük bir oranın yakalanması ekonomik istikrar olarak görülmektedir. Ancak kurlardaki değişim, dış talep yetersizliği sebebiyle gerekli üretim

artışının oluşmaması, kişi başına düşen geliri dolar bazında arttırmamakta ve enflasyonun istenilen seviyede tutulmasını engellemektedir.

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THE ROLE OF SOCIO-ECONOMIC THEORY IN FINANCIAL MARKET: REVIEW OF INVESTORS BEHAVIOUR AND THEIR PSYCHOLOGICAL BIASES

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ABSTRACT

The efficient market hypothesis assumes that investors behave rationally, by using all relevant information, and analyse it in the most effective way to achieve the best possible outcome. However, many investors appear to behave in irrational ways. For example, irrelevant information, such as rumour, is used and the analysis may be subject to misinterpretation, emotion and other psychological bias. Investors may not base decisions on their own views about investments, but upon what they see as the majority view. The majority being followed are not necessarily well-informed rational investors. The investors that are followed may be uninformed and subject to psychological biases that render their behaviour irrational (from the perspective of economists). Rational investors may even focus on predicting the behaviour of irrational investors rather than trying to ascertain fundamental value. This may explain the popularity of technical analysis amongst market professionals. This paper compares and evaluates the existing literature of psychological bias, based on the critical analysis of uneconomic variables, such as weather and biorhythmic variables, on investors' mood that are found in the literature. This paper argues for the need to develop a new methodology to examine the efficient market hypothesis by reflecting psychological bias as a main driver of financial market assessment.

Keywords: Socio-economic theory, investors behaviour, psychological biases, financial market

JEL Classification: G02, G14, G15

1. INTRODUCTION

It can be argued that the *market efficiency* paradigm has only come to dominate Western academic thought relatively recently. After the inflation-related economic crises of the 1970s and the collapse of the Soviet Union and Warsaw-Pact-related socialism in the world, capitalism became the main economic paradigm in the world. The arguments of Friedman and his fellow monetarists succeeded in influencing politicians such as Reagan in the US and Thatcher in the UK. Simultaneously, models related to market efficiency, such as the rational expectations hypothesis (REH) and the efficient market hypothesis (EMH), began to develop a dominant role in academia.

One of the consequences has been that mathematical models have been used extensively to examine market efficiency. For example, we see the widespread use of tools such as runs tests, serial correlation, variance ratio and GARCH models to examine the level of market efficiency.

The implication of the EMH was that, because investors behave rationally and competitively, financial markets would constantly set prices reflecting *all available information* and so markets were efficient. Accordingly, the market price would constantly reflect more perfect information than was available to any one individual and, therefore, no one could expect to "*beat the market*". This included any regulators and provided extra academic support to monetarist thought, which was also accepted by many governments, particularly in the UK. Constant market price fluctuations were dismissed as meaningless random fluctuations, akin to a *random walk*. Even though EMH failed to explain five major crises in the financial markets; in stock markets in 1987, bank lending in emerging markets in 1994, currencies in 1998, the new economy dot-com bankruptcies of 2003-2007 and credit markets in 2008 (Petrochilos, 2010), it is still the most accepted theory in the field.

This paper compares and evaluates existing literature of psychological bias based on the critical analysis of uneconomic variables, such as weather and biorhythmic variables, on investors' mood. This paper argues for the need to develop a new methodology to examine the efficient market hypothesis by reflecting psychological bias as a main driver of financial market assessment.

The paper begins with a brief review of the market efficiency paradigm, in the second section socio-economic theory and investor behaviour are presented. This is followed by identifying the different forms of psychological bias in section three. In section four, critical analysis of previous research is presented before, finally, some brief conclusions are drawn.

2.SOCIO-ECONOMIC THEORY AND INVESTOR BEHAVIOUR

Prechter's socio-economic hypothesis (1999) suggested that human interaction spreads moods and emotions. It is argued that, when moods and emotions become widely shared, the resulting feelings of optimism or pessimism cause uniformity in financial decision-making. This amounts to herding and has impacts on financial markets at the aggregate level. Furthermore, Calvo and Mendoza (1997) examined the effect of herd behaviour on the volatility of the capital market at the beginning of the Mexican crisis; from 1991 to mid-1993 short-term public debt was smaller than gross reserves. A large debt-reserves imbalance developed in 1993–1994, and ended with the collapse of the currency; short-term public debt was nearly three times larger than reserves. Tesobonos alone, including commercial bank holdings, exceeded US\$22 billion in December 1994, compared with gross reserves of less than US\$13 billion at the beginning of the month. By the end of December 1994, reserves fell to nearly US\$6 billion, well below the critical US\$10 billion set by the Bank of Mexico. Calvo and Mendoza's (1997) focus was on the effects of the globalization of financial markets. According to that paper, as the number of markets grows and the share of the country's assets in the investors' portfolios declines, the payoff of gathering information on country-specific information becomes smaller and the incentives for herding behaviour grows stronger.

Kaminsky and Schmukler (1999) studied the origins of the Asian crisis and discuss the harmful effect of rumour, arguing that the existence of herd behaviour significantly deteriorates the economic conditions in periods of market stress. Lu and Zhu (2006) pointed out the destabilizing effect on the stock market of China caused by the herd behaviour of the fund investors. Patterson and Sharma (2007) assumed that, due to short-term pressure caused by investors, moves in market prices of assets from their fundamental values may provide opportunities for the formation of bubbles and crashes.

It has been argued that the stock market is a direct index to social mood; it reflects the combined level of optimism or pessimism in a society at any given time (Prechter, 1985, 1999; Green, 2004). Nofsinger (2005), for example, argues that social mood influences the judgments made by consumers, investors and corporate managers. He indicates that the level and nature of business activity will follow social mood rather than lead it.

3. PSYCHOLOGICAL BIASES

3.1. Influence of Emotion and Mood

Studies by psychologists have found that mood appears to affect predictions about the future. People in a good mood are more optimistic about the future than people in a bad mood (Wright and Bower, 1992). The impact of mood on financial decisions has been referred to as the "misattribution bias" (Nofsinger, 2005). If a person is in a good mood, they will have a tendency to be optimistic when evaluating an investment. Good moods may cause people to be more likely to take risky investments (for example choosing stocks rather than bonds). Nofsinger (2002) has suggested an optimism bias. Optimism reduces critical analysis during the investment process and causes investors to ignore negative information. Furthermore, mood affects investment behaviour (Baker and Nofsinger, 2002; Nofsinger, 2002). It has been suggested that good moods make people less critical. Good moods can lead to decisions that lack detailed analysis.

People transmit moods to one another when interacting socially. People not only receive information and opinions in the process of social interaction, they also receive moods and emotions. Moods and emotions interact with cognitive processes when people make decisions. There are times when such feelings can be particularly important, such as in periods of uncertainty and when the decision is very complex. Moods and emotions may be unrelated to a decision, but nonetheless affect the decision. Moods and motives produced by spiritual factors will affect individual decisions. The general level of optimism or pessimism in society will influence individuals and their decisions, including their financial decisions.

There is a distinction between emotions and moods. Emotions are often short term and tend to be related to a particular person, object or situation. Moods are free-floating and not attached to something specific. A mood is a general state of mind and can persist for long periods. Mood may have no particular causal stimulus and have no particular target.

A positive mood is accompanied by emotions such as optimism, happiness and hope. These feelings can become extreme and result in euphoria. A negative mood is associated with emotions such as fear, pessimism and antagonism. Nofsinger (2005) suggested that social mood is quickly reflected in the stock market, such that the stock market becomes an indicator of social mood. Prechter (1999), in proposing a socio-economic hypothesis, argued that moods cause financial market trends and contribute to a tendency for investors to act in a concerted manner and to exhibit herding behaviour.

Many psychologists would argue that actions are driven by what people think, which is heavily influenced by how they feel. How people feel is partly determined by their interactions with others. According to the socio-economic hypothesis (Prechter, 1999; Nofsinger, 2005), moods can be transmitted through social contact and a widely shared, or social, mood emerges. Contact between people conveys mood as well as information. Collectively, shared moods influence individual decisions, with the effect that trends emerge. At times, mood can dominate over reason in the decision-making process. It has been found that people in depressed moods are less willing to take risks (Yuen and Lee, 2003) and a negative mood is associated with a desire for asset preservation and safety (Kavanagh et al., 2005). A positive mood renders people more trusting (Dunn and Schweitzer, 2005) and, for many people, trust in the financial services industry is a big issue when considering investments. A positive social mood results in perceived trustworthiness, low risk and high returns whilst negative social mood is associated with low trust, high perceived risk and low anticipated returns (Olson, 2006).

Furthermore, social mood is a collectively shared state of mind (Prechter, 1999; Nofsinger, 2005; Olson, 2006). Investors with no knowledge of analysis are particularly likely to be influenced by social mood when making investment decisions. DeLong et al (1990) illustrated a class of investors whose expectations were not justified by the fundamentals and they referred to them as “*noise traders*”. Unjustified expectations are referred to as *investor sentiment*. When sentiment is shared amongst investors, stock prices can deviate from fundamental values for long periods.

People in a peer group tend to develop the same tastes, interests and opinions (Ellison and Fudenberg, 1993). Social norms emerge in relation to shared beliefs. These social norms include beliefs about investing. The social environment of investors influences investment decisions. This applies not only to individual investors but also to market professionals. Fund managers constitute a peer group; fundamental analysts are a peer group; technical analysts comprise a peer group. Indeed, market professionals in aggregate form a peer group. It is likely that there are times when these peer groups develop common beliefs about the direction of the stock market.

3.2. Herd Behaviour

Hirshleifer (2001) states that people have a tendency to conform to the judgements and behaviours of others. People may follow others without any apparent reason. Such behaviour results in a form of herding. If there is a uniformity of view concerning the direction of a market, the result is likely to be a movement of the market in that direction.

Herding is an irrational behaviour and low information cost strengthens herding. Banerjee (1992) defines herding as “everyone doing what everyone else is doing, even when their information suggests doing

something different.” Furthermore, Shiller (2000) ventured that the meaning of herd behaviour is that investors tend to do as other investors did. They imitate the behaviour of others and disregard their own information. Kultti and Miettinen (2006) proposed that, if the cost of information about predecessors’ actions is very expensive, then all the agents will act according to their own signals but, if observing is free, everyone acts in accordance with herding behaviour. Facing financial panic, investors may not have enough time to collect valuable information from many scattered sources. Investors may herd during financial panic. Prechter and Parker (2007) suggest that uncertainty about valuation may cause herding.

Walter and Weber (2006) distinguished between intentional and unintentional herding. Intentional herding is seen as arising from attempts to imitate others, whereas unintentional herding emerges as a result of investors analysing the same information in the same way. Intentional herding could develop as a consequence of poor availability of information. Investors might imitate the behaviour of others in the belief that others have traded on the basis of information. When imitating others in the belief that they are acting on information becomes widespread, there is an *informational cascade*.

Another possible cause of intentional herding arises as a consequence of career risk. If a fund manager loses money whilst others make money, that fund manager’s job may be at risk. If a fund manager loses money whilst others lose money, there is more job security. So it can be in the fund manager’s interest to do as others do (this is sometimes referred to as the ‘reputational reason’ for herding). Since fund managers are often evaluated in relation to benchmarks based on the average performance of fund managers, or based on stock indices, there could be an incentive to imitate others since that would prevent substantial underperformance relative to the benchmark.

Walter and Weber (2006) found that investors bought stocks following price rises and sold following falls. If such momentum trading is common, it could be a cause of unintentional herding. Investors do the same thing because they are following the same strategy. It can be difficult to know whether observed herding is intentional or unintentional.

Hwang and Salmon (2006) investigated herding in the sense that investors, following the performance of the market as a whole, buy or sell simultaneously. Their investigations into the US, UK and South Korea markets show that herding increases with market sentiment. They found that herding occurs to a greater extent when investors’ expectations are relatively identical. Herding is strongest when there is confidence about the direction in which the market is herding. Herding appeared to be persistent and slow moving. This is consistent with the observation that some bubbles have taken years to develop.

Deutsch and Gerard (1955) distinguish between ‘normative social influence’ and ‘informational social influence’. Normative social influence does not involve a change in perceptions or beliefs, merely conformity for the benefit of conformity. An example of normative social influence would be that of professional investment managers who copy each other on the grounds that being wrong when everyone else is wrong does not jeopardize one’s career, but being wrong when the majority get it right can result in job loss. This is a form of regret avoidance. If a bad decision were made, a result would be the pain of regret. By following the decisions of others, the risk of regret is reduced. There is safety in numbers. There is less fear of regret when others are making the same decisions.

Informational social influence is acceptance of a group’s beliefs as providing information. For example, a share purchase by others delivers information that they believe that prices will rise in future. This is accepted as useful information about the stock market and leads others to buy. This is an informational cascade. People see the actions of others as providing information and act on that information. Investors buy because they know that others are buying, and in buying they provide information to other investors, who in turn buy purchase more investments. Informational cascades can cause large, and economically unjustified, swings in stock market levels. Investors cease to make their own judgments based on factual information and use the apparent information conveyed by the actions of others instead. Investment decisions based on relevant information cease, and hence the process whereby stock prices come to reflect relevant information comes to an end. Share price movements come to be disconnected from relevant information.

Welch (2000) investigated herding among investment analysts. Herding was seen as occurring when analysts appeared to mimic the recommendations of other analysts. It was found that there was herding towards the prevailing consensus, and towards recent revisions of the forecasts of other analysts. A conclusion of the research was that in bull markets the rise in share prices would be reinforced by herding.

Furthermore, the media are an integral part of market events because they want to attract viewers and readers. Generally, significant market events occur only if there is similar thinking among large groups of people, and the news media are vehicles for the spreading of ideas. The news media are attracted to financial markets because there is a persistent flow of news in the form of daily price changes and company reports (Redhead, 2008).

The media seek interesting news and can be fundamental propagators of speculative price movements through their efforts to make news interesting (Shiller, 2000). They may try to enhance interest by attaching news stories to stock price movements, thereby focusing greater attention on stock price movements. The media are also prone to focussing attention on particular stories for long periods. Shiller refers to this as an 'attention cascade'. Attention cascades can contribute to stock market bubbles and crashes.

Davis (2006) confirmed the role of the media in the development of extreme market movements. The media were found to exaggerate market responses to news, and to magnify irrational market expectations. At times of market crisis, the media can push trading activity to extremes. The media can trigger and reinforce opinions.

Nevertheless, Brown (1999) examined the effect of noise traders (non-professionals with no special information) on the volatility of the prices of closed-end funds (investment trusts). A shift in sentiment meant these investors moved together and an increase in price volatility resulted. Walter and Weber (2006) also found herding to be present among managers of mutual funds.

3.3. Overconfidence

Psychological research has indicated that there is a self-attribution bias in decision-making. When an investment is successful, the investor believes that it is due to his or her skill. An unsuccessful investment is seen to fail as a result of bad luck or the actions of others. The self-attribution bias leads to overconfidence. Overconfidence is also reinforced by the hindsight bias, which a false belief is held by people who know the outcome of an event that they would have predicted the outcome. Overconfidence may be particularly characteristic of inexperienced investors who find that their initial investments are profitable. Their belief in their own skill leads them to invest more. Thus, a bull market can generate overconfidence, which causes more investing, thereby reinforcing the upward price movement. There are those who interpret their gains in a bull market as arising from their own skill. They see certainty where there is uncertainty. This can lead them to invest beyond a rational level, and painful losses result when the market falls.

Overconfidence can arise from excessive confidence in the quality of one's information and an exaggerated view of one's ability to interpret that information. This leads to an unwarranted degree of certainty about the accuracy of one's forecasts and a corresponding underestimation of risk (Barber and Odean, 1999). As a consequence, overconfident investors are prone to invest to a greater extent than would be the case if they properly understood the quality of their forecasts. Barber and Odean (1999) found that overconfident investors tend to take more risks than less confident investors do.

During the bull market, individual investors increased their levels of trading. Investors allocated higher proportions of their portfolios to shares, invested in riskier stocks (often technology companies), and many investors borrowed money in order to increase their shareholdings (Barber and Odean, 2001). It is likely that, during the bull market, individual investors attributed much of their success to their own expertise and became overconfident as a result.

3.4. Illusion of Control

A psychological bias that helps to produce overconfidence is the illusion of control. People often behave as if they have influence over uncontrollable events (Presson and Benassi, 1996). A number of attributes have been identified as fostering the illusion of control. One of these is the outcome sequence. Early positive outcomes

give a person more illusion of control than early negative outcomes. This is demonstrated by the tendency of people to become addicted to gambling if their first few bets are successful. In a rising stock market, people investing for the first time will experience gains. This is likely to engender the illusion of control, overconfidence, and the inclination to invest more. If significant numbers of people invest more, prices will continue to rise, thereby reinforcing these psychological biases.

The illusion of control and overconfidence may explain why a great number of investors choose actively managed funds when index funds outperform them and have lower charges. It might be that overconfidence in their own selection abilities and the illusion of control provided by the ability to choose between funds cause investors to pick actively managed funds even though index funds offer better potential value (Redhead, 2008).

Langer (1975) mentions that people usually find it hard to accept that outcomes may be random. He makes a distinction between chance events and skill events. Skill events involve a fundamental link between behaviour and the outcome. In the case of chance events, the outcome is supposed to be random. However, people often think of chance events as skill events. When faced with randomness, people normally behave as if the event were controllable or predictable. If people engage in skill behaviour, such as making selections, their belief in the controllability of a random event becomes stronger. Additionally, there is substantial evidence that investment managers are unable to outperform stock markets. Yet, since investment managers engage in skill behaviours of analysis and choice, they are likely to see portfolio performance as controllable. Retail investors and financial advisors also tend to think that the performance of their investment choices is controllable and that the act of selection between mutual funds enhances the illusion of control.

Another attribute that fosters the illusion of control is the acquisition of information. Increased information increases the illusion of control and the degree of overconfidence. This has been called the illusion of knowledge (Nofsinger, 2005; Peterson and Pitz, 1988). The information may or may not be relevant to the investments. Particularly, for investors with little knowledge of investment, information does not give them as much understanding as they think because they lack the expertise to interpret it. They may be unable to distinguish relevant and reliable information from irrelevant and unreliable information. However, to the extent that stock market gains lead investors to seek information, the information obtained is likely to increase the illusion of control and the extent of investing. The resulting investment will help to perpetuate the share price rises and thereby the psychological biases.

3.5. Narrow Framing

Narrow framing refers to the tendency of investors to focus too narrowly. One aspect is focussing on the constituents of a portfolio rather than the portfolio as a whole. Since individual investments tend to be more volatile than the investor's portfolio as a whole, such narrow framing causes investors to overestimate price volatility. This could cause people to invest too little (Redhead, 2008).

Another dimension of narrow framing is the focus on the short term even when the investment horizon is long term. It is not rational for an investor accumulating assets for retirement in twenty-five years' time to be concerned about the week-to-week performance of the portfolio. Yet long-term investors do focus on short-term volatility. Studies have shown that when, in experimental situations, people have been presented with monthly distributions of returns they are less likely to invest than when they are shown annual distributions (with the annualized volatility being the same in both cases). The implication is that focus on short-term volatility deters investment. It appears that people do not appreciate the effects of time diversification. Time diversification is the tendency for good periods to offset bad periods with the effect that the dispersion of investment returns does not increase proportionately with the period of the investment. Investors who focus increasingly on short-term fluctuations overestimate stock market risk and allocate too little of their money to stock market investment (Redhead, 2008).

Table 1: Summary of the Various Psychological Biases Found in the Literature

Psychological Biases	Explanation	Implementation
Influence of Emotion and Mood	Mood appears to affect predictions about the future.	Misattribution bias, optimism bias, social mood bias.
Herd Behaviour	Everyone doing what everyone else is doing, even when their information suggests doing something different.	Normative social influence bias, informational social influence bias. Intentional and unintentional herding bias.
Overconfidence	When an investment is successful, the investor believes that it is due to his or her skill. An unsuccessful investment is seen to fail as a result of bad luck or the actions of others.	Self-attribution bias
Illusion of Control	People often behave as if they have influence over uncontrollable events.	Illusion of knowledge bias
Narrow Framing	The tendency of investors to focus too narrowly.	Overestimate bias

4. Critical Analysis the Impact of Weather and Biorhythmic Variables on Investors' Mood

Weather and length of daylight are factors that can affect mood. The effects of such factors on investment decisions have been researched. Hirshleifer and Shumway (2003) investigated the effects of sunshine on stock market returns. When the sun is shining people feel good. This may increase optimism and affect investment decisions. It may be the case that investors are more likely to buy shares when the sun is shining. The purchases would cause stock prices to rise. Stock markets in twenty-six cities were examined by the authors. They found that stock market returns (price increases) were higher on sunny days. When comparing the sunniest days with the worst days, it was found that there was an annualized difference of 24.6% on average.

Kamstra et al. (2003) looked at the relationship between hours of daylight and stock market returns. They found that stock markets performed relatively poorly during the autumn as the hours of daylight fell. This was most marked for the more northerly stock markets. Consistent with this theory is the observation that the effect occurred over October to December in the northern hemisphere, and over April to June in the southern hemisphere. This study is consistent with the view that sunlight affects mood and mood affects investment decisions. Sunlight enhances optimism about the future and the prospective future returns from investments.

Empirical evidence from existing studies that have investigated the effects of weather and environmental conditions on volatility is mixed. Chang et al. (2008) show that New York City cloudiness increase intraday volatility in NYSE firms over the entire trading day. These authors used two volatility proxies, one based on the range of the intraday prices and the other on the basis of the standard deviation of the bid-ask mid-point returns. Both of these proxies are uncommon in the literature and their accuracy is unknown. Dowling and Lucey (2008) studied the empirical effect of seven mood proxies on both the returns and variances of thirty-seven national equity market indices and twenty-one small capitalization indices. They employed GARCH-type processes to approximate and model the variations in the conditional variance of returns. Their results show that wind, precipitation, geomagnetic storms, daylight saving time changes and seasonal affective disorder (SAD) are all positively related to conditional volatility for most of the indices considered.

Kaplanski and Levy (2009) considered the effect of SAD and temperature on the VIX options implied volatility index that is traded in the Chicago Board Options Exchange (CBOE). They used a measure of so-called 'actual' volatility based on the historical standard deviation of a monthly window of daily returns. The authors found that the number of daylight hours is negatively related only to the 'perceived' volatility proxy by the VIX and

not to the 'actual' historical volatility measure. Another study that indirectly shows a positive relationship between volatility and bad weather is that of Kliger and Levy (2003). These authors, based on their usage of S&P500 index options data, found that bad moods, as a proxy for total cloud cover and precipitation, makes investors place higher-than-usual probabilities on adverse events.

Mehra and Sah (2002) show that even small fluctuations in investors' attitudes towards risk, which could result from weather-related shifts in their moods, can have an impact on market volatility. Chang et al. (2008) suggested that the empirical implication for the relationship between weather and volatility is that social moods can be associated with more disagreement in valuation opinions among investors. Therefore bad weather can be expected to be inversely related to market volatility. On the other hand, studies such as those of Brown (1999), Gervais and Odean (2001) and Statman et al. (2006) suggest that when investors are in a good mood, which can be associated with fair weather, they tend to trade more, which in turn increases volatility. Moreover, another explanation has been given by Kaplanski and Levy (2009) that if SAD induces seasonality in returns and returns are negatively correlated with volatility, then SAD can indirectly create seasonality in volatility in the opposite direction.

5. CONCLUSION

The history of economic thought has shown a tendency for new and old theories to be synthesized. After Fama (1970) introduced the EMH, market anomalies appeared in the financial market and challenged the validity of the EMH, some of these market anomalies disappeared after they were documented in the literature. Even so, market efficiency theory is still the main theoretical framework of studying financial market, given its emphasis on statistical analysis. Socio-economic theory believes that examining the results from just an efficiency perspective is highly limiting as the observed behaviour of investors will be influenced by behavioural psychological forces. These are likely to be especially important during the time of uncertainty.

This study contributes significantly to the literature by comparing and evaluating the role of psychological bias in financial markets. Critical analysis in this paper of uneconomic variables provided evidence that investor decisions are influenced by their state of mind. Finally, the considerable variety of results found in the literature suggest that *the efficient market hypothesis* and *socio-economics theory* need to implement a new mathematical model that provides a better understanding of financial market mechanisms.

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EMPIRICAL ANALYSIS OF INTERACTION BETWEEN PROMOTION EXPENDITURES AND TOURISM: THE CASE OF TURKEY*

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ABSTRACT

The Turkish tourism sector is among the first places in international markets in terms of number of visiting tourists. But the same situation is not valid in terms of tourism revenue. At this point, tourism promotion becomes important for the Turkish economy. The Ministry of Culture and Tourism arranges promotional activities in different regions of the world to increase the number of tourists and revenue of tourism sector. But it is possible to interpret that tourism demand is not sufficient compare to potential of the country because of absence of effective and planned promotion policy. The aim of this study is to test interaction between tourism promotion expenditures, tourism revenue and number of tourists by employing recently developed Vector Autoregressive based Toda–Yamamoto and conventional Granger causality methods. In the study, annual data belonging to period between years 1990 and 2012 is used. Results of the empirical analyses give evidences about the relation between tourism promotion expenditures, tourism revenue and number of tourists. Findings obtained from both conventional Granger and Toda – Yamamoto causality tests imply that there is a causation linkage running from tourism promotion expenditures to number of tourists visiting Turkey. Results also indicate that there is no causal relationship between tourism promotion expenditures and tourism revenue.

Keywords: Tourism, tourism demand, promotion expenditure, tourism income

JEL Classification: C22,L83,Z33

TANITIM HARCAMALARI VE TURİZM İLİŞKİSİNİN AMPİRİK BİR ANALİZİ: TÜRKİYE ÖRNEĞİ

ÖZET

Uluslararası piyasalarda, turizm sektörü ile ilk sıralarda yer alan Türkiye ziyaretçi sayısı açısından elde ettiği başarıyı, turizm geliri açısından elde edememiştir. Bu noktada Türkiye'nin turizm tanıtımı oldukça önemli hale gelmektedir. Kültür ve Turizm Bakanlığı her yıl yurtdışında tanıtım faaliyetlerinde bulunmaktadır. Ancak etkin ve planlı bir tanıtım politikası oluşturulmadığından yeterli turizm talebi yaratılamamaktadır. Bu çalışmanın amacı turizm tanıtım harcamaları ile elde edilen turizm geliri ve gelen turist sayısı arasındaki ilişkiyi son dönemlerde yaygın olarak kullanılmaya başlayan Toda–Yamamoto nedensellik testi ile VAR'a dayalı klasik Granger nedensellik testi yöntemleri ile test etmektedir. Çalışmada, 1990-2012 yılları arasındaki döneme ait veriler kullanılmıştır. Analizde turizm tanıtım harcamaları (TH), turizm geliri (TG), turist sayısı (TS) değişkenleri arasında bir ilişkinin olduğuna dair kanıtlar elde edilmiştir. Zira elde edilen bulgular, turizm tanıtım harcamaları hem geleneksel Granger nedensellik testi hem de Toda-Yamamoto nedensellik sonuçlarına göre turist sayısının Granger nedenidir. Tanıtım harcamaları ve turizm geliri arasında bir ilişki bulunamamıştır.

Anahtar Kelimeler: Turizm, turizm talebi, tanıtım harcamaları, turizm geliri

JEL Sınıflandırması: C22, L83, Z33

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1. GİRİŞ

Turizm sektörü, dünya ekonomisinde akış halinde olan ve birçok etkene bağlı gelişen bir gelir kaynağıdır. Özellikle 20. yüzyılın ikinci yarısından sonra yaşam kalitesi ve refah düzeyi artan ülkelerde turizm artık ön plana çıkmış olup insanlar kendi kültürleri dışındaki, farklı kültürleri incelemeye, tanımaya ve onlarla etkileşim kurmaya başlamışlardır. Güvenilir ve ihtiyaçlarını karşılayacak yeni yerler arayan insanlar yeni teknolojilerle birlikte dünyada gidebilecekleri yerleri keşfedip başka ülkeleri ziyaret etmektedirler. İnsanlar ekonomik, sosyal, kültürel, ekolojik ve teknolojik değişimlerin sonucunda ihtiyaçlarını turizm faaliyetlerine katılarak karşılamaya başlamışlardır. Ülke ekonomisine büyük bir katkı sağlamasından dolayı turizm faaliyetleri sosyal, kültürel, politik etkilerinden çok ekonomik etkileri ile çalışmalara konu olmuştur. Turizm ulusların gelirini arttıran, ülkelere döviz girdisi sağlayan, yatırımları arttıran, yeni istihdam olanakları yaratan, ödemeler bilançosu eşitliğini sağlayan, bölgesel ve ulusal ekonomik gelişmelere katkıda bulunmada rol oynayan önemli bir faktör haline gelmiştir. Turizmin bu ekonomik yönü gelişmekte olan ülkeler için kalkınmanın itici gücü olarak kabullenmesine yol açmıştır. Bu güçten yararlanmak isteyen ülkeler uluslararası pazarda turist potansiyeline erişmek için rekabet etmek zorundadırlar.

Dünya’da ve Türkiye’de önemli bir yere sahip olan turizm sektöründen beklenen yararların gerçekleşebilmesi için öncelikle etkin bir talebin yaratılması, yaratılan aktif talebin beklentilere cevap verebilecek arz kaynaklarının varlığına ve turistlerin ülkelere memnun dönmelerinin sağlanmasına bağlıdır. Turizm talebini, yeterli satın alma gücüne ve boş zamana sahip olup belirli bir zaman diliminde farklı amaçlar doğrultusunda turistik mal ve hizmetlerden faydalanan ya da yararlanmak isteyen kişiler oluşturmaktadır (Olalı ve Timur, 1987, s.196). Söz konusu talebin yaratılması içinde etkili tanıtım ve imaj faaliyetlerine ihtiyaç duyulmaktadır (Çetinel, 2001, s.151). Yabancıların belli bir ülke ya da bölgeyi ziyaret etmek için kararlarını belirleyici nedenlerden birisi turizm şirketlerinin ve hükümetlerin tanıtım, reklam ve pazarlama faaliyetleridir.

Tanıtma, bir ülkenin kamuoyunda olumlu bir imaj yaratmak amacıyla çeşitli iletişim tekniklerinden yararlanarak açık, sürekli ve yoğun şekilde yürütülen bilgilendirme faaliyetleridir (Hacıoğlu 1992, s. 125). Bir başka deyişle “ Ulusal, toplumsal, öznel veya nesnel bir imge yaratmak için halka ilişkiler ve enformasyon hizmetlerini sürdüren her türlü iletişim düzenlemeleridir” şeklinde de ifade edebiliriz (Eralp, 1978, s.160–163). Turizmde tanıtım ise insanların ilgilerini bir ülkenin, bölgenin veya turistik istasyonun mal ve hizmetleri üzerine çekmek, bilgi vermek, hafızada bir imaj yaratmak suretiyle turistik mal ve hizmetleri satın almaya yönelmek, bütün bunların sonucunda ekonomik kazanç sağlamak amacıyla yararlanılan teknikler bütünü olarak ifade etmek mümkündür (Oral, 1994’den aktaran Turanlı, 2003: 4). Bu doğrultuda turistik tanıtım ile dış tanıtım kavramlarını birbirinden ayırmak gerekmektedir. Bir ülkenin dış tanıtımı çok daha kapsamlı olup siyasal, ekonomik, kültürel ve turizm tanıtımını birlikte içinde barındıran bir kavramdır (Olalı, 1983, s. 10).

Tanıtım, turizmin gelişmesi, ülkeye yönelik talebin artması açısından hayati derecede önemlidir. Tanıtım sayesinde insanların dikkatini turistik mal ve hizmetlerin üzerine çekme, onlara bu mal ve hizmetlerin fiyatları, özellikleri, kaliteleri gibi konularda bilgi verme, telkinde bulunma ve bunun sonucunda da hedef kitle veya kitlelerin nezdinde olumlu bir imaj yaratma sansına sahip olunabilmektedir (Arslan, 2007, s. 4-5).

Son yıllarda yaşanan hızlı nüfus artışı, ekonomik kriz, iklim değişikliği, enerji ihtiyacı, açlık, fakirlik, göç, sosyal kaynaşma, ülkesel bütünlük, terör, güvenlik gibi sayıları giderek artan sorunlar uluslararası toplumu meşgul etmektedir. Bu sorunlara, küreselleşme olgusunun beraberinde getirdiği olumlu ve olumsuz gelişmeler sonucunda dünya, köklü bir değişim ve dönüşüm süreci içine girmiştir. Bu süreçte, farklı özellik ve birikimlere sahip bölgeler ile kıtalar arasındaki yolların kesiştiği kavşakta yer alan Türkiye, coğrafi konumunun yarattığı fırsatları değerlendirip, olumsuz etkileri kazanımlara dönüştürebilme potansiyeline sahiptir. Bu kazanımları elde edebilmenin bir yönü turizm tanıtım kampanyalarıyla turistleri çekebilme potansiyelidir.

Türkiye’nin tanıtımı ile ilgilenen kuruluşların sayısı oldukça fazladır ve bunların faaliyetlerinin Türkiye’nin tanıtım uygulamaları olarak nitelendirilmesi mümkündür. Söz konusu kuruluşlar arasında en yetkili olan kurum Turizm Bakanlığıdır. Türkiye’nin yurt dışındaki imajının geliştirilmesi, Türkiye’nin uluslararası turizm pazarındaki payının artırılması, böylece hem döviz kazandıran hem de istihdam yaratan bir sektör olan turizmin, ülkenin sosyo - ekonomik gelişimine olan katkılarının en üst düzeye çıkarılması, bakanlığın tanıtım faaliyetlerinin amacı olarak belirtilmiştir (Şahbaz, 2000).

Bu çalışmada turizm tanıtım harcamaları ile elde edilen turizm geliri ve gelen turist sayısı arasındaki ilişkiyi son dönemlerde yaygın olarak kullanılmaya başlayan VAR nedensellik ve Toda-Yamamoto nedensellik testi gibi ekonometrik yöntemlerle test etmektedir. Çalışmanın tasarımı şu şekildedir: birinci bölüm giriş, ikinci bölümde literatür taraması, üçüncü bölümde ekonometrik yöntem ve verilerin tasarımı, dördüncü bölümde ampirik bulgular ve son bölümde ise sonuç ve öneriler kısmına yer verilmektedir.

2. LİTERATÜR TARAMASI

Türkiye'nin tanıtımına yönelik harcanan kaynakların, turizm talebine ve turizm gelirine olumlu etkisinin olup olmadığına dair ilk çalışma 1984-1999 yılları arasında kapsayacak şekilde Şahbaz (2000) tarafından gerçekleştirilmiştir. Şahbaz çalışmasında, sonuç olarak Türkiye'nin yurt dışında tanıtılması için gerçekleştirilen harcamalar ile Türkiye'nin turizm gelirleri ve Türkiye'ye gelen turist sayısı arasında olumlu yönde bir ilişki olduğu ortaya koymuştur.

Tanıtım harcamaları ve turizm talebi üzerine yapılan çalışmalara baktığımızda Arslan (2014), 2001-2012 yılları arasında tanıtım harcamalarının dış turizm talebine ve turizm gelirine olan etkisinin ölçmüştür. Bu çalışmanın Korelasyon ve Regresyon analizleri yardımıyla ulaştığı ortak sonuç, dış turistik tanıtım harcamaları ile turizm talebi ve turizm geliri arasında pozitif yönlü ilişkinin olduğu ve bu anlamda tanıtım ile talep ve gelir arasında olumlu bir ilişki olduğu sonucunda tanıtımaya daha fazla kaynak ayrılmasıyla diğer bağımlı değişkenlerde iyileşmelerin olacağı belirtilmiştir.

Tuna ve Çatı (2007) ise çalışmalarında, 1990-2006 dönemindeki tanıtım harcaması ile turizm talebi ve turizm geliri arasındaki ilişkiyi araştırmışlardır. Sonuç olarak, tanıtım harcamaları ile turizm talebi ve turizm geliri arasında pozitif yönlü ilişkinin olduğu ortaya çıkmıştır.

F.G. Çetinel'in (2001) yaptığı çalışmada 1996-2000 yılları arasında yurtdışında hedef pazar ülkelerde yazılı ve görsel medyada yer alan tanıtım faaliyetlerinin Türkiye'nin dış aktif turizm hareketine katılan turist sayısına etkisi ve medya araçlarının etkinliği ortaya konulmuştur.

Yurtdışında yapılan çalışmalara bakıldığında Divisekera ve Kulendran (2006), tanıtım harcamalarının turizm talebi üzerine etkilerini incelemiş, Avustralya'ya gelen turistlerden Japon turist talebinin tanıtım harcamalarına olumlu etkisi olduğu sonucuna varmıştır.

Diğer bir çalışma ise Deskins ve Seever (2011), ABD eyaletlerinde hükümetin turizm tanıtım harcamalarının turizme etkisini araştırmışlardır. 1985-2003 yılları arasındaki dönemi ele alan çalışmada turizm tanıtım harcamalarının, eyaletlerin ekonomik büyümeleri ve eyaletin istihdamındaki etkileri araştırılmıştır. Elde edilen bulgular turizm tanıtım harcamalarındaki yükselmenin, turizm ve istihdam üzerindeki etkisinin turizm harcamalarına bağlı olduğu sonucunu göstermektedir. Ek bir turizm tanıtım harcaması, turizm ve istihdamdaki büyümeyi artırdığı sonucuna varmışlardır.

3. VERİ SETİ VE METODOLOJİ

Bu çalışmada kullanılan veri seti T.C. Kültür ve Turizm Bakanlığı ve Dünya Bankası (WDI) veri tabanından temin edilmiştir. 1990-2012 dönemine ait yıllık serilerin kullanıldığı analizlerde tüm serilerin öncelikli olarak logaritmaları alınmıştır. Analizlerde E-Views 8.0 versiyonundaki ekonometrik paket programından yararlanılmıştır. Çalışmada kullanılacak olan ekonometrik modelin temel amacı, turist sayısı, turizm geliri ve turizm tanıtım harcamaları arasındaki nedensellik ilişkisini saptamaktır. Modelin basit şekilde ifade edilmiş hali aşağıdaki gibidir. Değişkenlerin modeli etkileme yönünün pozitif (+) olması beklenmektedir.

$$f=(TS, TH, TG)$$

Bu kapsamda oluşturulan modele ilişkin değişkenler ve anlamları aşağıda açıklanmaktadır:

TS: Ülkeye Gelen Yabancı Turist Sayısını,

TH: Turistik Tanıtım Harcamaları Bütçesi(milyon TL)

TG: Turizm Gelirleri (milyar TL), ifade etmektedir.

3.1. Birim Kök Testleri

Geleneksel Dickey-Fuller (DF) testleri sadece birinci dereceden bir AR (autoregressive) sürecini temel alarak süreci yürütürler (Dickey ve Fuller, 1981, s.1057-1072). Teste p gecikme uzunluğu olmak üzere AR(p) modeli için; boş hipotezinde ARIMA(p,1,0) otoregresif eşbütünleşik hareketli ortalama (autoregressive integrated moving average) sürecine karşılık alternatif hipotezde durağan ARIMA(p+1,0,0) süreci test edilir. Ancak hata teriminin beyaz gürültü özelliği gösterebilmesi diğer bir ifadeyle y_t serisinin önemli gecikmelerinden birisi unutulursa hata teriminde otokorelasyona neden olunur ve modele daha yüksek dereceden AR kökü eklemek gerekebilir. DF testinde 1. dereceden otokorelasyon süreci alındığı için hata teriminin (ε_t) beyaz gürültü özelliği gösterebilmesi amacıyla daha yüksek seviyede otokorelasyon sürecine sahip modellerin alınması gerekir (Kayhan vd., 2013, s.198).

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad \varepsilon_t \sim WN(0, \sigma^2) \quad (1)$$

$$\Delta y_t = c + \gamma y_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad \varepsilon_t \sim WN(0, \sigma^2) \quad (2)$$

$$\Delta y_t = c + \gamma y_{t-1} + \delta_2 t + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad \varepsilon_t \sim WN(0, \sigma^2) \quad (3)$$

1 no'lu denklemdeki regresyon sabit terimsiz ve trend değişkeninin olmadığı modeli, 2'deki regresyon sadece sabit terimin dahil edildiği modeli, 3'deki regresyon sabit terim ve trend değişkeninin dahil edilen modeli ifade etmektedir. Test süreci γ değişkeninin birden küçük olup olmaması üzerine kuruludur. Birim kök testi

sonucunda boş hipotezin reddi diğer bir ifadeyle alternatif hipotezin kabul edilmesi y_t serisinin birim kök taşımadığı ve durağan olduğu sonucuna ulaştırır. Serinin düzey değerinde durağan olması I(0), birinci farkında durağan olması I(1) ile ifade edilmektedir. Dickey-Fuller (1979) ADF testinin limit dağılımlarını türetmiş ancak MacKinnon (1991,1996) sonlu örneklem için kritik değerleri elde etmiştir.

3.2. Toda-Yamamoto Nedensellik Testi

Toda-Yamamoto (1995), VAR modeline dayanan ve değişkenlerin durağan olmadıkları durumda da düzey değerlerinin modele dâhil edildiği VAR modelinin tahmin edilmesine imkân vermekte ve standart Wald testinin uygulanmasını önermektedir. Ayrıca, serinin k serbestlik derecesi ile asimptotik χ^2 dağılımına sahip olduğu da ifade edilmektedir.

Bu bağlamda y_t dizisi 4 numaralı denklemdeki doğrusal fonksiyon ile şu şekilde ifade edilmektedir:

$$y_t = \beta_0 + \beta_1 t + \dots + \beta_q t^q + \eta_t \quad (4)$$

VAR ($k+d_{max}$) modelinde k , gecikme uzunluğunu ifade etmekte ve d_{max} ise maksimum entegrasyon derecesini ifade etmektedir. Buna göre, η_t VAR dizisi 5 numaralı denklemdeki gibi ifade edilmektedir:

$$\eta_t = J_1 \eta_{t-1} + \dots + J_k \eta_{t-k} + \varepsilon_t \quad (5)$$

Burada, $t = -k + 1, \dots, 0$ olmak üzere, $\eta_t; \eta_{-k+1}, \dots, \eta_0$ şeklini almaktadır.

Böylece,

$$\eta_t = y_t - \beta_0 - \beta_1 t - \dots - \beta_q t^q \quad (6)$$

eşitliği elde edilmiş olur ve bu eşitliği 6 numaralı denklemdeki yerine yazacak olursak:

$$y_t = \gamma_0 + \gamma_1 t + \dots + \gamma_q t^q + J_1 y_{t-1} + \dots + J_k y_{t-k} + \varepsilon_t \quad (7)$$

eşitliğini elde etmiş oluruz.

Burada $\gamma_i (i = 0, \dots, q)$; $\beta_i (i = 0, \dots, q)$ ve $J_h (h = 1, \dots, k)$ 'nin fonksiyonlarıdır. 7 ve 8 numaralı denklemlerdeki $q=1$ ve $d=1$ olarak kabul eder ve 9 numaralı denklemi yeniden yazarsak:

$$y_t = \gamma_0 + \gamma_1 t + J_1 y_{t-1} + \dots + J_k y_{t-k} + \varepsilon_t \quad (8)$$

eşitliği elde edilmiş olur. Toda-Yamamoto (1995), VAR sürecinin durağanlığı ile değil, 8. numaralı denklemdeki y 'nin gecikme uzunluğu ile ilgilenmektedir (Toda-Yamamoto, 1995: 227-228).

4. BULGULAR

Değişkenlere VAR'a dayalı Granger nedensellik ve Toda-Yamamoto nedensellik yöntemi uygulanmadan önce birim kök sorunundan arındırılması gerekmektedir. Bu amaçla seri mevsimsellikten ayrıştırıldıktan sonra Dickey ve Fuller (1979, 1981, ADF) tarafından geliştirilen birim kök testi yapılmıştır.

Tablo 1: Birim Kök Test Sonuçları

Değişkenler	ADF- p istatistiği (Düzyey)		ADF - p istatistiği (Birinci Fark)		
	Trendsiz	Trendli	Trendsiz	Trendli	
LTS	0.8932	0.1590	0.0001***	0.0006***	
LTG	0.7032	0.6786	0.0099***	0.0372**	
LTH	0.3120	0.1291	0.0001****	0.0003***	
Anlamlılık Düzeyi	% 1	-3.769	-4.440	-3.788	-4.467
	% 5	-3.004	-3.632	-3.012	-3.644
	% 10	-2.642	-3.254	-2.646	-3.261

Notlar: *.** ve *** değerleri sırasıyla %1. %5 ve %10 anlam seviyelerinde serilerin durağanlıklarını göstermektedir. ADF Testi için: * değeri SIC kriterine göre seçilen gecikme uzunluklarını ve gecikme uzunluklarının sıfır olması durumunda Dickey-Fuller test sonuçlarını göstermektedir.

Sonuçların yer aldığı Tablo 1'de değişkenlerin düzey değerlerinde birim kök taşıdığı, bu yüzden birinci farklarını alarak analize devam edilmesi gerektiği görülmektedir.

Tablo 2'de Korelasyon katsayısı sonuçlarına ilişkin bulgular yer almaktadır. Elde edilen bulgular Turizm Geliri (TG), Turist Sayısı (TS) ve Turizm harcamaları (TH) arasındaki ilişkilerin güçlü olduğunu göstermektedir.

Tablo 2: Korelasyon Katsayısı Sonuçları

	LTS	LTG	LTH
LTS	1	-0.5994	0.9061
LTG	-0.5994	1	-0.3847
LTH	0.9061	-0.3847	1

Öte yandan VAR'a dayalı Granger nedensellik yaklaşımında gecikme sayısı önemlidir. Tahmin edilecek VAR modeline geçmeden önce, model için uygun gecikme uzunluğunun belirlenmesi gerekmektedir.

Gecikme seviyesi araştırılan konunun niteliğine ve araştırmacının isteğine göre keyfi belirlenebileceği gibi tahminlerin güvenilirliği açısından bir kısım seçim kriterlerine başvurularak da belirlenebilmektedir. Son Tahmin Hatası (FPE), Akaike Bilgi Kriteri (AIC), Hannan Quinn (HQ) ve Schwartz (SC) kriterleri gecikme seviyesinin tespitinde kullanılan kriterler arasında yer almaktadır (Bozkurt, 2007, s.103-105; Çoban ve Özcan, 2013, s. 252). Çalışmada gecikme uzunluğu, VAR modeli için SC, LR, FPE ve HQ kriterleri 1 gecikme uzunluğunu vermektedir. Optimal gecikme seviyesi için dört kriterin de 1 gecikmeye işaret etmesi nedeniyle analizde gecikme seviyesinin 1 olmasına karar verilmiştir.

4.1. VAR-Granger Nedensellik Testi Sonuçları

Optimal gecikme seviyesi 1 olarak belirlenmesinden bir sonraki aşama olan VAR'a dayalı Granger nedensellik analizine geçilmiştir. Elde edilen sonuçlar Tablo 3'de sunulmaktadır.

Tablo 3: VAR-Granger Nedensellik Sonuçları

Değişkenler	Ki-Kare	Olasılık
MODEL I (Bağımlı Değişken= TS)		
TH=>TS	5.571634	0.0183**
TG=>TS	0.267961	0.6047
MODEL II (Bağımlı Değişken= TH)		
TS=>TH	3.092140	0.0787*
TG=>TH	1.239729	0.2655
MODEL III (Bağımlı Değişken= TG)		
TS=>TG	1.315738	0.2514
TH=>TG	0.122875	0.7259

Not: Oklar ilişkinin yönünü göstermektedir.

*,** ve *** değerleri sırasıyla %1, %5 ve %10 anlam seviyelerinde serilerin durağanlıklarını göstermektedir.

Tablo 3'de görüldüğü üzere nedenselliğin yönü açısından modeller değerlendirildiğinde Model I'de "Turist Harcamaları, turist sayısının Granger nedenidir" sonucu %5 anlamlılık seviyesinde kabul edilmiştir. Model II'de ise "Turist Sayısı Turizm harcamalarının Granger nedenidir" hipotezine baktığımızda ise %10 anlamlılık seviyesinde kabul edilmektedir. Dolayısıyla Turizm tanıtım harcamaları ile turist sayısı arasında çift yönlü bir ilişki vardır ($LREX \leftrightarrow LTS$). MODELDE II ve Model III ise elde edilen bulguların anlamlı olmadığı sonucuna varılmaktadır.

4.2. Toda-Yamamoto Nedensellik Sonuçları

Granger Nedensellik Testi'nden elde edilen sonuçların ardından çalışmada elde edilen sonuçları güçlendirmek amacıyla ek olarak ikinci adımda Toda-Yamamoto nedensellik testi de kurulan modellerde çalıştırılmıştır. Seriler orjinal değerleri ile $P+d_{\max}=3+1=4$ gecikme değerleri için tahmin edilmiştir. M Wald (Modified Wald) sınaması ise $p=3$ gecikme değeri için test çalıştırılmıştır. Elde edilen sonuçlar Tablo 4'de sunulmaktadır.

Tablo 4: Toda-Yamamoto Nedensellik Sonuçları

Değişkenler	F İstatistik Değeri	Olasılık
MODEL I (Bağımlı Değişken= TS)		
TH=>TS	3.171568	0.0749*
TG=>TS	0.624327	0.4294
MODEL II (Bağımlı Değişken= TH)		
TS=>TH	0.020920	0.8850
TG=>TH	0.014594	0.9038
MODEL III (Bağımlı Değişken= TG)		
TS=>TG	0.014130	0.9054
TH=>TG	0.462437	0.4965

Not: Oklar ilişkinin yönünü göstermektedir.

Toda-Yamamoto nedensellik testinden elde edilen sonuçlar incelendiğinde Granger nedensellik testi sonuçlarının büyük ölçüde örtüştüğü gözlenmektedir. Turizm harcamaları turist sayısının %10 anlamlılık düzeyinde nedenidir. Ancak turist sayısı ve turizm gelirleri turizm harcamasının nedeni değildir.

5. SONUÇ

Bu çalışmada, Türkiye’de turist sayısı, turizm tanıtım harcamaları ve turizm geliri arasındaki ilişki Granger Nedensellik Testi ve Toda-Yamamoto Yaklaşımları kullanılarak analiz edilmiştir. Elde edilen bulgular kurulan modellerin doğruluğunu kanıtlamaktadır. Granger nedensellik sonuçlarına göre turist sayısı ve turizm tanıtım harcamaları arasında çift yönlü bir nedensellik mevcutken; Turizm geliri ile herhangi bir nedensellik ilişkisi bulunmamaktadır. Toda-Yamamoto testi sonuçlarına göre turist sayısı ile yine turizm tanıtım harcamaları arasında bir nedensellik olduğu sonucuna varılmaktadır. Diğer değişkenler arasında ise herhangi bir nedensellik ilişkisi kurulamamıştır. Teorik olarak da aslında beklenti turizm tanıtım harcamalarının kamunun tek taraflı kararlılığına bağlı bir parasal büyüklüktür. Bu yüzden de turizm gelirlerinden etkilenmemesi teorik olarak da beklenen bir olgudur. Öte yandan turist sayısının turizm tanıtım harcamalarını uzun dönemde motive etmesi beklenebilir ve elde edilen bulgular bunu destekler niteliktedir.

Son olarak sonraki araştırmalar için yol gösterici olması açısından iki öneri sunulabilir: İlk olarak bu çalışma sadece Türkiye turizmi ve tanıtım harcamaları arasındaki ilişki üzerine yoğunlaşmaktadır. Bunun dışında farklı değişkenlerde modele dahil edilerek araştırmanın kapsamı genişletilebilir. Literatür taraması kısmı bu anlamda yol gösterici niteliktedir. İkinci olarak, çalışmada sadece nedensellik ilişkisi ampirik olarak test edilmiş olup eşbütünlük tahminine yer verilmemiştir. Bu bulgular ışığında farklı ekonometrik testler de yapılabilir.

KAYNAKLAR

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THE TONE OF ANNUAL REPORTS AS A STRATEGIC PERFORMANCE MANAGEMENT TOOL: APPLICATION ON TURKEY'S BORSA ISTANBUL CORPORATE GOVERNANCE INDEX FIRMS

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ABSTRACT

The annual reports have been identified as one of the key corporate governance practice. If these reports are genuinely being prepared in an attempt to improve the clarity of communication with stakeholders, and give related and necessary information accurately to them, then they become one of the strategic tools affecting performance positively. Therefore, in this study, we aimed a semantic examination of the English versions of annual reports from companies quoted on Borsa Istanbul included in the Corporate Governance Index to see whether the annual reports' tone has an impact on company performance. With this aim, the contents of 2014 annual reports are analyzed by the text-analysis software package Diction 7 and scores for accomplishment, cooperation, activity and optimism are obtained. Efficiency scores are calculated by Data Envelopment Analysis to evaluate to what extent annual reports' tone and corporate governance ratings impact on company performance. The results show that the annual reports' tone and corporate governance ratings have a significant positive impact on efficiency scores, so on performances of companies.

Keywords: Corporate governance, DEA efficiency, annual reports, content analysis, firm performance.

JEL Classification: G30, L25, M10

1. INTRODUCTION

Informing all interested parties about a company's financial situation, performance, ownership structure, strategies and other conditions, and all related information in a timely and accurate manner is strategically important to surviving and prospering in the long term. In this context, the annual reports of companies are crucial, since they summarize and explain the financial and economic performance of the company, its strategies and accomplishments and future cooperation and expectations to all shareholders. Companies are becoming aware that the annual report is a potential tool for clients, investors, all shareholders and stakeholders.

Studies have indicated that annual reports to shareholders and the president's letter they contain are important vehicles for communicating information to shareholders and other interested stakeholders. Most corporate officers see annual reports as their primary channel to shareholders (Abrahamson & Park, 1994).

The annual report has been identified as one of the key corporate governance practices, and specifically an example of a communicative tool. Like all such tools it is strategically and deliberately undertaken to satisfy a particular communicative purpose or objective. If these reports are genuinely being prepared in an attempt to improve the clarity of communication with stakeholders, and give related and necessary information accurately to them, then they become one of the strategic tools affecting performance positively.

This work offers a semantic examination of the English versions of annual reports from companies quoted on Borsa Istanbul (BIST) and included in the Corporate Governance Index (XKURY) to see whether the annual reports' tone has an impact on company performance. First, an efficiency score is obtained for 2 inputs (assets and number of employees in 2014) and 4 outputs (market capitalization, average price, book value per share and price/book value per share in 2015) by Data Envelopment Analysis (DEA). Then the contents of the 2014 annual reports are analyzed by the text-analysis software package Diction 7 and scores for accomplishment,

cooperation, activity and optimism are obtained. Finally, efficiency scores are calculated by including content analyses scores and corporate governance ratings as inputs. This efficiency score is compared with the previous efficiency scores to evaluate to what extent annual reports' tone and corporate governance ratings (CGR) impact on company performance.

The study contributes to the literature regarding developing countries as well as the impact of tone in annual reports on company performance, a focus that has received little attention. This study differs from previous work on the subject both in terms of content analysis and companies under examination, and in terms of method, by making use of Diction 7 software and comparison of efficiency scores by DEA.

2. LITERATURE REVIEW

1.1. Annual Reports and Disclosure

If companies and countries want to grow, they require new investments. When their own resources are not enough for new investments external finance is required for development and for diversification. However, external investment can be provided only in a good investment environment. Thus, improving the quality of corporate governance is essential for global investors. In this regard, one of the principles of corporate governance is "public disclosure and transparency". In accordance with this principle, companies inform all interested parties about their financial situation, performance, ownership structure, strategies and other conditions and all related information in a timely and accurate manner. In this context the annual reports of companies are crucial, since they summarize and explain the financial and economic performance of the company, its strategies, accomplishments and future cooperation and expectations to all shareholders. These companies are becoming aware that the annual report is a potential tool for clients, investors, all shareholders and stakeholders.

Signaling theory says that (Spence, 1973) the main objective of firm disclosure is to inform analysts and investors of relevant information about firm quality and value. In this regard, Verrecchia (1983) suggests that corporate disclosure helps analysts and investors to predict future earnings, as corporate managers have to disclose value-relevant information. This suggests that voluntary disclosure decisions lead to the reporting of relevant information about firm performance.

In this regard, Clarke (1997) sees the annual reports as a shop window for all quoted company stocks and shares and, more importantly, a tool to reassure investors that the company is surviving and prospering in the long term. This stems from the fact that dealing with potential shareholder dissonance is vital for stable and long-term security in the stock market (Clarke, 1997; 32).

Based on these theoretical suggestions, prior studies have attempted to empirically examine the relevance of voluntary corporate disclosure. Some of the research in this field focused on companies web sites; for example, Cormier et al. (2009) examined the websites of 189 companies in Canada, Gandia (2008) examined the websites of 92 Spanish listed companies, Vergauwen et al. (2006) examined the websites of 270 companies in Austria, Belgium, France, the Netherlands, South Africa and the United Kingdom, and Branco et al. (2014) investigated the use of the Internet by the largest companies based in Sweden and Spain to communicate their engagement in corporate social responsibility. Some other research focused similarly on annual reports to determine the disclosure level of the companies: Sengupta (1998) used the data of total disclosure score for 311 different companies, Botosan (1997) measured 122 manufacturing firms' disclosure level, Silva and Alves (2004) calculated public disclosure level of 150 Brazilian, Argentinean and Mexican firms, Fan et al., (2003) worked with 144 Chinese companies, Huafang and Jianguo (2007) examined 559 Chinese companies' disclosure level, and Kahveci and Taliyev (2016) tested 92 Russian companies disclosure level (Kahveci & Taliyev, 2016). There are also numerous studies that stress and examine executives' statements in annual reports (Hutt, 2010; Fiol, 1995). Studies have also shown that investors find the letters from companies' presidents in their annual reports a useful source of information.

The functions of annual reports have been analyzed from various research perspectives. One strand of the literature notes that the reports may have an impression management purpose, with the text, graphs and photographs directing the reader towards a favorable interpretation of corporate activities (Wisniewski &

Yekini, 2014). An in-depth literature review provided by Stanton and Stanton (2002) discusses the different theoretical viewpoints on annual reports.

There are then generally two types of research carried out in this area: (1) surveys of readers to ascertain their subjective opinions; and (2) analysis of content to make inferences about the author's or institution's intentions (Clarke, 1997; 33).

Hrasky and Smith (2008) assume corporate reporting is an important component of the investor relations function, and they look for evidence as to whether concise financial reports result in clearer communication between the company and its report users. In their study, characteristics of the chairperson's annual report letter and graph use in annual reports containing a concise financial report were compared to those in traditional full reports of listed Australian companies. According to their results, if concise reporters genuinely wish to improve the clarity of their communications, greater attention needs to be paid to how information is presented in their broader annual report (Hrasky & Smith, 2008).

Hutt (2010) examined annual report letters from CEOs of publicly owned restaurant franchising companies in order to map the stakeholders of companies. Nineteen public restaurant franchisers, ranked by worldwide sales, on the Franchise Times (2007) top 200 list were used in this study. The CEOs' annual report letters for 2007 were analyzed using two features of the AntConc text analysis software: word list and keywords. The study found that CEO letters in annual reports include widely varying and extensive references to groups, organizations, and individuals, all of whom may be potential stakeholders of the organization. International and domestic franchisers used at the same time a unique set of references not used by the others and a variety of common references. Additionally, international franchisers tended to focus on customers and other output links while domestic franchisers attended more to management, employees, and other inputs links. His study proposed a methodology for using text analysis software, such as AntConc, to identify the groups, organizations, and individuals CEOs referred to in annual report letters (Hutt, 2010).

Lin et al. (2012) collected the annual reports of the 660 public listed companies in Taiwan and applied content analysis to company annual reports to obtain the disclosure information for human capital. They used human capital related keywords as the unit of analysis and counted the frequency of them to form an additive index of human capital disclosure. According to their results, human capital disclosure positively impacts on organizational performance such as market-to-book ratio and ROA. Organizational size negatively moderates the relationship between disclosure of human capital information and firm performance. Knowledge intensity has a curvilinear positive moderation effect on the relationship above. Firms engaging in knowledge-based competition can achieve better performance by disclosing human capital information when their knowledge intensity grows in a curvilinear fashion. Human capital disclosure also delivers important messages to employees and enhances operational and financial performance (Lin et al. 2012).

Hamrouni et al. (2015) empirically investigated the relationship between corporate voluntary disclosure and firm performance using a panel data of 1,074 firms-year listed on the Euronext Paris stock market. They used a non-parametric approach to measure firm performance via the technical efficiency. Using DEA, they measured a firm's ability to maximize its value (outputs) given a set of determinants (inputs). They used disclosure indexes which measure the extent of voluntary disclosure in annual reports. The empirical findings reveal a positive relationship between disclosure indexes and performance measures. They provide evidence that the level of voluntary information disclosed in annual reports plays a significant signaling role for firm performance. However, the extent of this role depends on the nature of the voluntary disclosure, i.e. whether it involves strategic, financial or corporate governance information (Hamrouni et al. 2015).

Nekhili et al. (2012) used a sample of 84 French listed firms over the 2000-2004 period and developed an R&D disclosure index composed of 32 hand-collected items from annual reports. They examined whether voluntary R&D disclosure impacts the firm's market value, and whether it is influenced by ownership structure. According to their findings, voluntary R&D disclosure improves the market value of equity, suggesting that the benefits from disclosures of R&D activities exceed the disclosure costs. Another finding of their research is that the more French firms invest in R&D, the larger the amount of R&D-related information they disclose. Also, R&D

capitalization provides incentives for companies to disseminate more R&D-related information (Nekhili et al. 2012).

Hamrouni and Ratsimbanier (2012) used DEA and stochastic frontier analysis models on a sample of 50 listed French firms belonging to the Sociétés des Bourses Françaises (SBF250) index from 2004 to 2008. They focused on the extent of voluntary disclosure in the annual reports measured using a composite disclosure index. Their results show that the level of disclosed information varies insignificantly across time for some firms and is similar for others (Hamrouni & Ratsimbanier 2012).

Fiol (1995) compared executives' public and private statements to explore whether and along what dimensions public statements reflect internal company communications. Comparisons of internal and external documents generated by the forest products industry over ten years revealed no significant correlations in the two sets of documents between executives' positive or negative evaluations of events and situations; however, the correlations between their perceptions of control were positive and significant (Fiol 1995).

Manzoni (2007) applied DEA to the corporate social responsibility (CSR) management capacity dimensions of the organization behavior performance measurement framework in an Australian bank with national and international operations. DEA was applied to 231 Decision Making Units (DMU) of the bank to identify which were the most efficient CSR performers even though the bank itself had achieved premier gold star ratings on the national CSR indexes for the last four years. He used six factors as inputs for the singular corporate social responsibility output. These input factors were: 1) communication, 2) humanistic orientation, 3) integrated ethics, 4) commitment to ethics, 5) perceived organization support and 6) distributive justice (Manzoni, 2007).

1.2. Content Analysis

The task of categorizing text documents or summarizing them using quantitative measures may be neither straightforward nor easy to implement. Some authors have tried to achieve these objectives using human judgment (Hrasky & Smith 2008; Kahveci & Taliyev, 2016; Nekhili et al. 2012; Courtemanche et al., 2013; Fiol 1995; Hamrouni & Ratsimbanier 2012; Clarke, 1997).

Recent advances in computational linguistics afford researchers the opportunity to utilize computerized approaches to content analysis. Such approaches rely on the construction of dictionaries that compile words with similar characteristics or meanings. Subsequently, the frequency with which these words occur in a particular text is measured, providing a reliable gauge of a given semantic dimension. Scott (2012) did a semantic network analysis used CATPAC; Hutt (2010) examined CEOs' annual report letters using AntConc. Wisniewski and Yekini (2014) used Diction 6.0 for content analysis of annual reports.

Today a variety of software for text analysis is available which support text analysis tasks within different disciplinary contexts in considerably different ways. Alexa and Zuell (2000) reviewed fifteen currently available software sets for text and discussed the tendencies both in functionality and technology of modern text analysis software. Of the 15 software packages they reviewed, the following typically are categorized as qualitative: AQUAD, ATLAS.ti, HyperRESEARCH, NUD_IST, QED and Win-MAXpro; CoAn, DICTION, DIMAP-MCCA, KEDS, TEXTPACK, TextSmart and WordStat are categorized as quantitative ones. Code-A-Text and TATOE support operations which belong to both qualitative and quantitative analysis (Alexa & Zuell, 2000).

Scott (2012) did a semantic network analysis using the abstracts from all the presentations from each of the past nine years of the conference on corporate communication to examine how the central themes in the study of corporate communication have changed over the years. She used a word co-occurrence program known as CATPAC. The semantic network analysis examined the relationship among the words of the abstracts to determine clusters of shared themes. Each year's worth of abstracts were examined in the form of a dendrogram. In this way, how the themes of study have changed over the life of the Conference on Corporate Communication could be visualized and tracked. Although it is possible to see the change, the actual areas of study are subject to interpretation. It is possible to have a different interpretation based on the experience with the field (Scott, 2012).

Clarke (1997) examined annual reports to determine the differences in messages associated with the mission of the company: increasing share value, increasing dividends, or both. She also aimed to uncover differences in

content resulting from positive and negative financial performance. She selected randomly 32 companies from a population of 156 investment companies quoted on the London Stock Exchange in 1994 that also subscribed to the Financial Times annual report service. She used content analysis to uncover the major themes in these annual reports. The methods included in the research were word frequency counts, KWIK-Key Word in Context and concordances which list words by type into construct categories (Clarke, 1997).

Courtemanche et al. (2013) examined the dynamic relationships between board capital, strategy and organizational environment. They conducted a 10-year (1997 – 2006) longitudinal case study of Bombardier Inc., a publicly traded global transportation company. According to their results, they found various links between four dimensions of board capital and changes at three strategic levels: institutional, corporate and business. There were significant changes in board human and relational capital over the period of analysis, even though board independence remained constant (Courtemanche et al., 2013).

Ege et al. (2013) examined 18 companies quoted on the BIST which are included in the corporate governance index to compare the financial performance results with corporate governance scores. They applied TOPSIS - multi-criteria decision analysis method to obtain financial performance results. As the analysis results showed that rankings acquired from performance score and corporate governance score do not move accordingly. Besides this, the result shows that the quality of corporate governance of the companies does not have an influence on financial performance (Ege et al. 2013).

Branco et al. (2014) investigated the use of the Internet by the largest companies based in Sweden and Spain to communicate their engagement in CSR activities. Non-parametric statistics were used to analyze some factors that influence disclosure, namely country, industry affiliation, profitability, and size. Their findings suggest that in spite of the existence of a high degree of similarity between CSR communication practices, companies from Spain place social responsibility information in more prominent sections and devote more space to said information. Swedish companies are found to disclose more their codes of conduct/ethics and CSR-related press clips and published articles. (Manuel et al., 2014).

Performance should be analyzed beyond financial ratios criteria and systems, and should be measured in terms of corporate governance, organization behavior and supply chain management because these factors determine the performance of enterprises in the broader socio-economic perspective generally, and corporate social responsibility specifically (Manzoni, 2007).

Wisniewski and Yekini (2014) examined the entire narrative included in annual report, as the content analysis of longer texts can provide a more reliable indication of style and language. They employed a computer-assisted approach to counting the frequencies of words falling into particular categories – categories that appear to matter to financial markets. They used Diction 6.0 as text analysis software (Wisniewski & Yekini, 2014).

Jeanjean et al. (2015) studied the economic consequences of non-English-speaking companies adopting English as an external reporting language. They collected a sample of 102 companies that initiated the issuance of an annual report in English (i.e., in addition to the local language annual report). According to their findings issuing an annual report in English in addition to the local-language report is associated with a decrease in information asymmetry, an increase in analyst following, and an increase foreign investor ownership (Jeanjean et al. 2015).

2. DATA AND METHODOLOGY

2.1. Research Goal

In this research, consistent with previous works, our aim is to use annual reports as a voluntary disclosure tool (Sengupta 1998; Botosan, 1997; Silva & Alves, 2004; Fan et al., 2003; Huafang & Jianguo, 2007; Kahveci and Taliyev, 2016) and to carry out a content analysis of the reports to quantify the data to evaluate the effect of one year's annual reports tone about the future path of firm on the next year's performance and efficiency by using DEA as an analytical tool. DEA measures relative performance (efficiency) and is useful in comparing organizations or parts of organizations that share common goals, use similar resources (but not necessarily in the same proportions) and produce similar results (Rouse et al. 2010). DEA uses multiple inputs to produce

multiple outputs. DEA identifies DMUs that produce the largest amount of output by consuming the least amount of input. These DMUs are classified as efficient (Cooper et al., 2006).

Moreover, we utilized a text-analysis software package (Scott, 2012; CATPAC; Hutt, 2010; AntConc.; Wisniewski and Yekini, (2014); Diction 6.0) called Diction 7. Diction 7 is a computer-based program that searches a passage for five general lexical features as well as thirty-five sub-features to determine the tone of a verbal message. The software conducts its searches via a 10,000-word corpus and up to thirty user-created custom dictionaries that allow researchers to specific topical or negative words for particular research objectives. By now, as a quantitative (Alexa & Zuell, 2000) text analysis software, Diction is well-established within the academic community, with many studies relying on it as a content analysis method, particularly in the fields of political science, communication and language analysis, as well as in media studies. A full list of books and academic articles that engage with Diction can be found on the software's web page¹.

We used two master variables out of five that we believe are important in terms of future behavior and future attributions: Certainty and Optimism. The two master variables are defined below (Diction 7, 2016):

- Optimism - Language endorsing some person, group, concept or event, or highlighting their positive entailments.
- Activity - Language featuring movement, change, the implementation of ideas and the avoidance of inertia.

Besides the two master variables, two dictionaries, accomplishment and cooperation, out of 31 are used as inputs. It is believed that all four variables, optimism, activity, accomplishment and cooperation, are important and significant in terms of future action, behavior and attributes of the company. Detailed information about the master variables is given in Appendix A.

The four Diction scores have been chosen as the evaluative criteria since it has been believed that optimism is related to how a company is optimistic about its future, cooperation is related to what kind of cooperation a company will carry out, activity is related to how actively a company is committed to investments, cooperation, marketing strategies and generally to how company would follow a proactive strategy and lastly accomplishment is related to what kind of accomplishment a company obtained and to what kind of accomplishment a company would expect in the future.

2.2. The model and selection of inputs, outputs

In order to evaluate XKURY companies quoted on BIST, we used two different models shown in figure 1 and figure 2. In first model, efficiency scores are obtained for two inputs: assets (Feroz et al, 2003; Samad & Patwary, 2003; Ulucan, 2000 and 2002; Zhu, 2000; Nath et al., 2008) and number of employees (Sueyoshi et al., 2010; Chandra et al., 1998; Kim et al., 2009; Samad & Patwary, 2003; Ulucan, 2000 and 2002; Zhu, 2000; Kahveci, 2011) in 2014 and four outputs: market capitalization (Ulucan, 2000 and 2002; Zhu, 2000; Kahveci, 2011), average price, book value per share and price/book value per share in 2015. Then the contents of the 2014 annual reports were analyzed by text-analysis software package Diction 7 and scores for accomplishment, cooperation, activity and optimism are obtained. Then, in second stage, content analyses scores and CGRs are added to the model as inputs and efficiency scores are calculated accordingly. Second stage efficiency scores are then compared with the first stage efficiency scores to evaluate to what extent annual reports tone and CGRs impact company performance. By doing this, it has been evaluated how the scores of the tone of future expressions in annual reports and the corporate governance ratings given by the independent rating institutions impact on the company's efficiency scores. Efficiency scores are calculated by MaxDea software.

¹ Please see: <http://www.dictionsoftware.com/published-studies/>

Figure 1: Model 1 for 45 DMU XKURY Index Firms of BIST

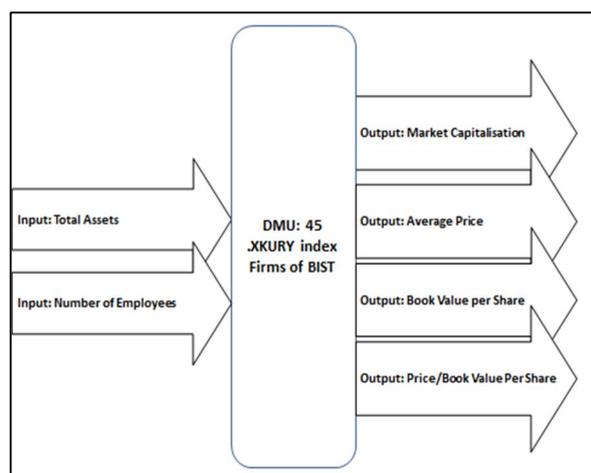
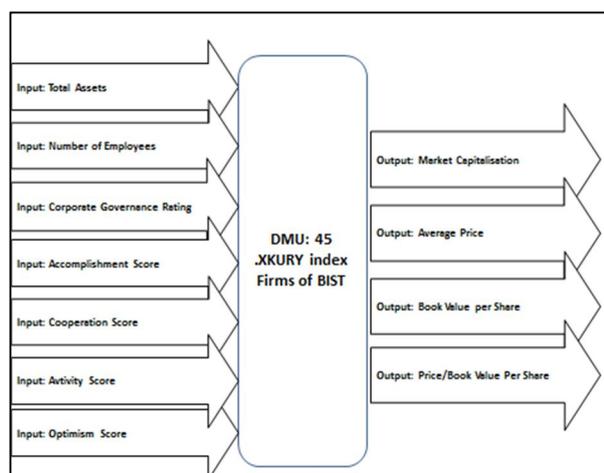


Figure 2: Model 2 for 45 DMU XKURY Index Firms of BIST



2.3. Sample and Data Collection

Based on signaling theory (Spence 1973), we considered corporate voluntary disclosure, and in this study it is assumed that annual reports function, as a signaling instrument reporting firm performance to investors and financial analysts.

Fifty companies included in the XKURY of BIST were chosen as a sample. We argue that the annual report language can be an information processing constraint and a barrier to foreign investment and that using English for external reporting purposes is a potential strategy for companies in non-English-speaking countries to reduce the information frictions and to, therefore, increase the accessibility of the company's financial statements for investors and analysts. It is believed that companies included in the XKURY index are the best companies in Turkey in terms of corporate governance practices and they must target both domestic and foreign investors, therefore, they prepare the best annual reports in English in Turkey. That is the reason why we decided to use the English version of their annual reports in this research. Of the 50 companies included in XKURY, 45 are used in this research since four of them do not have any annual report in English for 2014 and one of the company's data could not be obtained from Reuters.

The BIST XKURY aims to measure the price and return performances of companies traded on Borsa Istanbul Markets (except companies on the Watch List and Lists C and D) with a corporate governance rating of a minimum 7 out of 10 as a whole and a minimum of 6.5 for each main section. The corporate governance rating is determined by the rating institutions incorporated by the Capital Markets Board in its list of rating agencies as a result of their assessment of the company's compliance with corporate governance principles.

It is important to examine annual reports for the extent to which they accurately communicated what managers do or what managers think, in other words, managers' interpretations of their activities and their environments. The potentially important indicators of subsequent decisions and actions are managers' interpretations of the future. Fiol (1995) says if one's aim is to identify the interpretive frames of reference that guide future behaviors, the appropriate focus is on the future rather than past attributions (Fiol, 1995). Consistent with this suggestion we used 2014 annual reports to evaluate 2015 performances. The 2014 annual reports and the 2014 corporate governance ratings should give some insight to investor for 2015, and company's 2015 performance should be affected accordingly. In this context, companies' annual reports of 2014 and CGRs of 2014 were obtained from their websites, and year-end 2015 financial data obtained from the Reuters terminal. Then, calculated Diction 7 scores are used as inputs with CGRs to see company's efficiency in terms of their performance.

4. FINDINGS AND DISCUSSIONS

Firstly efficiency scores are calculated by using companies' assets and number of employees in 2014 as input and average price, market capitalization, book value per share and price/book value per share of 2015 as output. Then, secondly scores of the tone of future expressions in annual reports and the corporate governance ratings given by the independent rating institutions are added to the model as inputs and efficiency scores are calculated for model 2. In this stage the message given in annual reports and companies' corporate governing ratings are accepted as corporate governance implementations and by adding these inputs to the model it enables us to see how and to what extent corporate governance implementations impact on companies' efficiency scores. It should also be noted that the traditional DEA models can be analyzed in two ways, an input orientation or an output orientation. The objective of an input oriented model is to minimize inputs while producing at least the given output levels, on the other hand, the objective of an output oriented model is to maximize outputs while using no more than the observed amount of any input. (Cooper et al., 2000). In terms of this study, we believe that it is appropriate to adopt an output maximization assumption since it is widely accepted in strategy research that the main aim of the firm is to maximize market value. Thus, the firm using given inputs should be able to maximize market value and so market price.

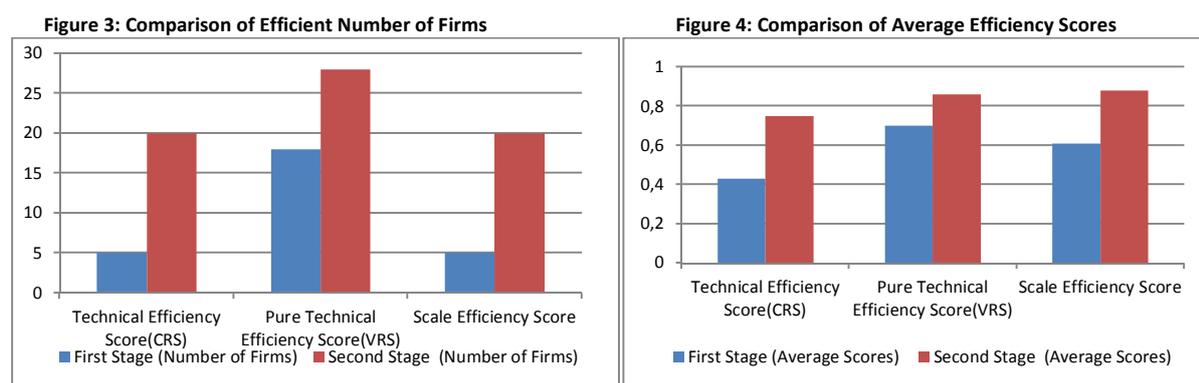
Developed by Charnes, Cooper and Rhodes (CCR) (1978) a model with Constant Returns to Scale (CRS) are used for technical efficiency, on the other hand, developed by Banker, Charnes and Cooper (BCC) (1984) a model with Variable Returns to Scale (VRS) are used for pure technical efficiency. If technically efficient DMU has an inefficiency coming from scale inefficiency, it cannot be technically (totally) efficient. Farrell (1957) describes technical efficiency in terms of a firm's success at producing the maximum level of outputs from a given set of inputs employed. The technical efficiency (TE) score generated by DEA for a DMU is a relative measure showing the particular DMU's input-output conversion performance relative to all other DMUs in that particular sample. Scale efficiency (SE), on the other hand, compares the input-output conversion performance of a hypothetical firm that is 100% efficient under VRS with the input-output conversion performance of another hypothetical firm (of the same size) that is efficient under CRS. The relation between technical efficiency and pure technical efficiency is shown by the equation below (Cooper et al, 2006: 141; Ulucan, 2002; Kahveci, 2011).

$$\text{Technical efficiency} = \text{Pure technical efficiency} \times \text{Scale efficiency}$$

All the results are given in table 1. When the results are analyzed, it becomes very clear that corporate governance implementation has a significant positive impact on the efficiency scores of companies. Average technical efficiency score was 0.43, pure technical efficiency was 0.70 and average scale efficiency was 0.61 in the first stage and increased to 0.75, 0.86 and 0.88 respectively in the second stage. On the other hand, while there are five firms which have technical and scale efficiency and are eighteen firms which have pure technical efficiency in the first stage there are twenty firms which have technical and scale efficiency and twenty eight firms which have pure technical efficiency in the second stage. Efficient firms have significantly increased when scores of the tone of future expressions in annual reports and corporate governance ratings added as inputs to the evaluation as seen in figure 3 and figure 4.

Table 1: Efficiency Scores of DMUs in Both Stages

DMUs	First Stage			Second Stage		
	Technical Efficiency Score(CRS)	Pure Technical Efficiency Score(VRS)	Scale Efficiency Score	Technical Efficiency Score(CRS)	Pure Technical Efficiency Score(VRS)	Scale Efficiency Score
AEFES.IS	0,25	0,63	0,39	0,63	0,72	0,88
AKSA.IS	0,63	0,80	0,79	0,81	0,81	1,00
ALBRK.IS	0,08	0,11	0,71	1,00	1,00	1,00
ANSGR.IS	0,22	0,24	0,89	0,25	0,35	0,72
ARCLK.IS	0,16	0,72	0,23	0,73	0,74	0,99
ASELS.IS	0,67	1,00	0,67	1,00	1,00	1,00
AYGAZ.IS	0,71	0,88	0,81	0,88	0,88	0,99
CCOLA.IS	0,39	1,00	0,39	1,00	1,00	1,00
CRDFA.IS	0,91	1,00	0,91	1,00	1,00	1,00
DOAS.IS	0,39	0,59	0,66	0,61	0,62	0,99
DOHOL.IS	0,55	0,95	0,58	1,00	1,00	1,00
ENKAI.IS	0,34	1,00	0,34	1,00	1,00	1,00
EREGL.IS	0,33	0,72	0,46	0,84	0,95	0,89
GARAN.IS	0,20	1,00	0,20	1,00	1,00	1,00
GARFA.IS	0,33	0,43	0,76	0,63	1,00	0,63
GLYHO.IS	0,11	0,18	0,58	0,24	1,00	0,24
HALKB.IS	0,13	0,64	0,20	0,65	0,67	0,96
HURGZ.IS	0,06	0,10	0,60	0,15	0,23	0,66
IHEVA.IS	0,23	0,26	0,89	0,25	1,00	0,25
IHLAS.IS	0,03	0,05	0,48	0,14	1,00	0,14
ISFIN.IS	0,21	0,30	0,70	0,57	1,00	0,57
ISGYO.IS	1,00	1,00	1,00	1,00	1,00	1,00
ISMEN.IS	0,15	0,28	0,55	0,39	0,50	0,77
IZOCM.IS	1,00	1,00	1,00	1,00	1,00	1,00
LOGO.IS	1,00	1,00	1,00	1,00	1,00	1,00
MGROS.IS	0,08	0,65	0,13	0,67	0,71	0,95
OTKAR.IS	0,60	1,00	0,60	1,00	1,00	1,00
PETKM.IS	0,71	0,94	0,76	0,94	0,94	1,00
PETUN.IS	0,77	0,91	0,85	0,91	1,00	0,91
PGSUS.IS	0,18	0,79	0,23	0,87	1,00	0,87
PINSU.IS	1,00	1,00	1,00	1,00	1,00	1,00
PNSUT.IS	0,80	1,00	0,80	1,00	1,00	1,00
PRKAB.IS	0,28	0,28	0,99	0,28	0,29	0,98
PRKME.IS	0,46	0,47	0,97	0,53	0,62	0,85
SISE.IS	0,13	0,45	0,28	0,56	0,64	0,88
SKBNK.IS	0,11	0,15	0,70	0,37	1,00	0,37
TAVHL.IS	0,33	1,00	0,33	1,00	1,00	1,00
TOASO.IS	0,56	1,00	0,56	1,00	1,00	1,00
TRCAS.IS	1,00	1,00	1,00	1,00	1,00	1,00
TSKB.IS	0,36	1,00	0,36	1,00	1,00	1,00
TTKOM.IS	0,25	1,00	0,25	1,00	1,00	1,00
TTRAK.IS	0,55	1,00	0,55	1,00	1,00	1,00
TUPRS.IS	0,86	1,00	0,86	1,00	1,00	1,00
VESTL.IS	0,05	0,26	0,19	0,30	0,31	0,94
YKBNK.IS	0,14	0,60	0,23	0,70	0,70	0,99
Average Score	0,43	0,70	0,61	0,75	0,86	0,88



When we look at the scores in terms of the sectoral groups manufacturing industry’s technical efficiency was 0.55 and scale efficiency was 0.68, whereas financial sector’s was 0.29 and 0.67, for others it was 0.42 and 0.62 respectively (Table 2). The firms operating in manufacturing industry have higher TE and SE scores in the first stages. Other firms (a group including one firm in mining, one firm in construction and public works, two firms in technology, two firms in wholesale trade and two firms in transportation, telecommunication and storage sector) have higher TE and SE efficiency scores in the second stage and have higher PTE score in the first stage. Firms in the financial sector have higher PTE scores in the second stage. From these scores, it can be concluded that firms operating in the manufacturing sector has higher efficiency in the first stage and firms operating in financial and in other sector have higher efficiency in the second stage. This conclusion can be interpreted as demonstrating that: the tone of future expressions in annual reports and corporate governance ratings have more positive impacts on the performance of firms in the financial and other sectors, compared to manufacturing sector firms.

Table 2: Comparison of Sectoral Efficiency Scores in Both Stages

Sector	First Stage (Average Scores)			Second Stage (Average Scores)		
	Technical Efficiency Score (CRS)	Pure Technical Efficiency Score (VRS)	Scale Efficiency Score	Technical Efficiency Score (CRS)	Pure Technical Efficiency Score (VRS)	Scale Efficiency Score
Manufacturing	0,55	0,77	0,69	0,79	0,84	0,92
Financial	0,32	0,60	0,60	0,72	0,92	0,84
Other	0,42	0,81	0,53	0,83	0,87	0,96

It is important to emphasize that fully efficient DMUs form a best practice production frontier and are benchmark peers for inefficient DMUs. Table 3, shows how many times an efficient DMU is used as a benchmark for another DMU in both stages. In the first stage, ISGYO.IS, IZOCM.IS and LOGO.IS are the most benchmarked firms in both CRS and VRS models, whereas TUPRS.IS and ASELS.IS are the most benchmarked firms only in the VRS model. However, in the second stage, IZOCM.IS and LOGO.IS continued as the most benchmarked firms and PNSUT.IS, TTRAK.IS and TUPRS.IS are added as the most benchmarked firms. In other words, IZOCM.IS, LOGO.IS, PNSUT.IS, TTRAK.IS and TUPRS.IS are the most benchmarked efficient firms in the second stage, which means their tone of future expressions in annual reports and corporate governance ratings have more positive impacts on their performance compared to other firms and if other firms use those firms as a benchmark for their applications they would have higher performance.

Table 3: Comparison of How Many Times an Efficient DMU is Used as a Benchmark for Another DMU

DMU	First Stage		Second Stage	
	Times as a benchmark for another DMU (VRS)	Times as a benchmark for another DMU (CRS)	Times as a benchmark for another DMU (VRS)	Times as a benchmark for another DMU (CRS)
ALBRK.IS	-	-	1	-
ASELS.IS	9	-	4	4
CCOLA.IS	-	-	3	2
CRDFA.IS	1	-	5	1
ENKAI.IS	1	-	1	-
GARAN.IS	5	-	4	4
GARFA.IS	-	-	4	-
GLYHO.IS	-	-	1	-
IHEVA.IS	-	-	2	-
IHLAS.IS	-	-	4	-
ISFIN.IS	-	-	3	-
ISGYO.IS	8	37	1	7
IZOCM.IS	11	13	6	13
LOGO.IS	12	37	10	11
OTKAR.IS	7	-	3	5
PETUN.IS	-	-	1	-
PINSU.IS	2	5	1	2
PNSUT.IS	3	-	6	9
TAVHL.IS	1	-	3	3
TOASO.IS	-	-	1	-
TRCAS.IS	1	4	-	-
TSKB.IS	1	-	-	-
TTKOM.IS	5	-	4	4
TTRAK.IS	6	-	6	8
TUPRS.IS	21	-	13	20

5. CONCLUSION

As a conclusion, corporate governance implementation scores of the tone of future expressions in annual reports and the corporate governance ratings given by the independent rating institutions have positive effects on companies' efficiency scores. In terms of sectoral efficiency, firms operating in the manufacturing sector have higher efficiency in the first stage and firms operating in financial and in other sector have higher efficiency in the second stage. This can be interpreted as demonstrating that: the tone of future expressions in annual reports and corporate governance ratings have more positive impacts on the performance of firms in the financial and other sectors, compared to manufacturing sector firms. In terms of firms' benchmarking position; IZOCM.IS, LOGO.IS, PNSUT.IS, TTRAK.IS and TUPRS.IS are the most benchmarked efficient firms in the second stage, which means their tone of future expressions in annual reports and corporate governance ratings have more positive impacts on their performance compared to other firms and if other firms use those firms as a benchmark for their applications they would have higher performance.

The study contributes to the literature regarding the impact of tone in annual reports on company performance, a focus that has received little attention. This study differs from previous work on the subject both in terms of content analysis and companies under examination, and in terms of method, by making use of Diction 7 software and comparison of efficiency scores with DEA. On the other hand, the practical implication of this study is the annual reports of companies are crucial, since they summarize and explain the financial and economic performance of the company, its strategies, accomplishments and future cooperation and expectations to all shareholders. As a strategic communication tool, choosing the right words and statements is crucial to attract additional new investments and to increase the value of the firm. Turkish companies might improve the optimistic, cooperative, activism and accomplishment tone of annual reports as an efficient corporate governance implementation. Good corporate governance rating would also help.

For further researches, similar studies can be conducted to see how the tone of annual reports and efficiency scores change over the years. Besides, comparison of Diction scores among different countries can be carried out to see the differences among countries and the effects on the firm performances.

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Appendix A: Diction 7 Master Variables

Master Variable	Definition	Formula
Certainty	Language indicating resoluteness, inflexibility, and completeness and a tendency to speak ex cathedra	[Tenacity + Leveling + Collectives + Insistence] – [Numerical Terms + Ambivalence + Self Reference + Variety]
Optimism	Language endorsing some person, group, concept or event or highlighting their positive entailments.	[Praise + Satisfaction + Inspiration] – [Blame + Hardship + Denial]
Activity	Language featuring movement, change, the implementation of ideas and the avoidance of inertia.	[Aggression + Accomplishment + Communication + Motion] – [Cognition + Passivity + Embellishment]
Realism	Language describing tangible, immediate, recognizable matters that affect people’s everyday lives.	[Familiarity + Spatial Terms + Temporal Terms + Present Concern + Human Interest + Concreteness] – [Past Concern + Complexity]
Commonality	Language highlighting the agreed -upon values of a group and rejecting idiosyncratic modes of engagement.	[Centrality + Cooperation + Rapport] – [Diversity + Exclusion + Liberation]

Source: Diction 7 Help Manual, 2015, p. 5.



ANALYSIS AND FORECASTS ON THE HEALTHCARE TOURISM INCOME OF TURKEY

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ABSTRACT

Turkey is one of the new centers of attraction for healthcare tourism with increasing efforts for improvement at policy making level. In line with the specific targets for healthcare tourism income set by the government, this study aims to analyze historical data of healthcare tourism income of Turkey over 2002-2015 and provide future forecasts. Both annual and quarterly healthcare tourism income data are analyzed to investigate the share of healthcare tourism income in aggregate tourism income and to search for seasonal effects. Results indicate that relying on the high correlation between aggregate tourism and healthcare tourism income, healthcare tourism income can be presented and forecasted as a percentage of annual tourism income. Seasonality is observed for the aggregate tourism income, where it is also present for healthcare tourism income between 2002 and 2009. It is also found that Turkey has an upward trend in health and aggregate tourism income.

Keywords: Tourism Income, healthcare tourism income, forecasting, Turkey

JEL Classification: I11, Z32, C53

1. INTRODUCTION

A recent shift in the demand structure followed by a significant increase in the patient mobility can be noted throughout the global healthcare industry due to several reasons such as differing costs, problems in local healthcare supply, increasing awareness as well as the intention to match vacations with medical care. Such a shift has resulted in establishment of a contemporary type of tourism, namely as *Healthcare Tourism* and it has begun to hold a major place in the national healthcare systems. Healthcare tourism conceptually consists of medical and thermal tourism, as well as services for the senior and the disabled (Çevirme, 2008; Tütüncü et al., 2011). Although the definition of the term health tourism is relatively recent, the notion has a long history dating back to 1990s. In the earlier stages, the direction was from underdeveloped countries to developed ones and it was mainly addressing the people in search for higher quality services and with resources to travel. Recent decades have experienced a reverse in trend; from developed countries to promising emerging countries, which provide high levels of medical quality for a relatively cheaper price. In that sense, Middle Eastern and Asian countries are becoming a center of attraction (Karuppan and Karuppan, 2010). Turkey is one of those emerging destinations in healthcare tourism with its proximity to Europe and Middle East, its numerous thermal resources and its competitive labor power in health and medical care (Kılınç, 2013).

The aim of this paper is to provide insight on past and future of healthcare tourism income of Turkey. We pursue two main objectives. First, we aim to analyze the share of healthcare tourism income within the aggregate tourism income of Turkey and its change over time followed by the identification of appropriate forecasting approach for future shares. Second, we target investigating the quarterly healthcare tourism income structure for any trends and seasonal effects and coming up with suitable forecasting approach for future income relying on this investigation. The search for seasonal effect is among our objectives because such an effect is a source of debate. Özkurt (2007) suggests that healthcare tourism does not have seasonality and should be uniform among the 12-month period; there are also traces of a higher demand in the summer periods (TÜRSAB, 2014). We aim to analyze the validity of those assertions of the previous research. With the

recent initiatives of Turkish government to promote healthcare tourism, such analyses are believed to be meaningful for planning the future of healthcare tourism in Turkey. The results may also provide a strategic insight for macro level decision makers in their decisions of marketing, investments and allocation of public resources.

The paper is organized as follows: Section 2 provides a brief insight on the literature of healthcare tourism and basics of Turkey's healthcare tourism. Section 3 describes the data set and methodology. Section 4 is devoted to findings and discussion of results. It consists of 5 main parts where first two is dealing with findings and forecasts using annual data. Sections 4.3, 4.4 and 4.5 presents the findings of analysis on quarterly data. Finally, Section 5 concludes.

2. LITERATURE REVIEW

2.1. Healthcare Tourism

Healthcare tourism is an emerging, global, multibillion-dollar industry with various stakeholders identified by Gupte and Panjamapirom (2014) as governments, travel industry, transport industry, clinical and non-clinical professionals, hospitals and patients. The number of medical tourists is expected to rise from approximately 10.5 million in 2011 to 23.2 million by 2017 and predicted to generate global revenue of approximately between \$40 and \$60 billion (Gupte and Panjamapirom, 2014). Major healthcare tourism destinations are Thailand, Singapore and India in Asia, Mexico, Brazil, and Colombia in Latin America, Jordan, Turkey, and United Arab Emirates (UAE) in the Middle East and Hungary, Poland and Czech Republic in Central-Eastern Europe (Beladi et al., 2015).

Forecasting tourism demand in general is one of the major areas of interest in tourism research. Several papers can be found in the literature analyzing the tourism demand trends and providing future forecasts with a country-wide focus in different countries such as Italy (Guizzardi and Mazzocchi, 2010), Spain (Claveria and Datzira, 2010), Egypt (Andrawis et al., 2011), Hong Kong (Wong et al., 2007) and Taiwan (Wang, 2009) or with a multiple-country focus (Shen et al., 2011). In a recent review, Song and Li (2008) state that the methods used in analyzing and forecasting the demand for tourism are very diverse. According to review by Witt and Witt (1995), no single forecasting method performs consistently best across different situations and this observation does not seem to change much when it has come to 2008.

Recently, with the emerging size of the market, the research on healthcare tourism is also gaining popularity. Several studies are dedicated to analyze the dynamics, trends and economics of healthcare tourism with an international focus (Lautier, 2014; Beladi et al., 2015). Some studies focus on healthcare tourism trends of specific regions such as Huang (2012) providing demand forecast in Asian countries, Lautier (2008) investigating the healthcare exports of Tunisia and Loh (2015) examining health-related travel spending by Canadian citizens for any shifts and trends. There also exists a research stream focusing on dynamics of recreational and wellness tourism, which can also be considered as a part of healthcare tourism (see Sayılı et al., 2007; Joppe, 2010; Csirmaz and Peto 2015).

2.2. Healthcare Tourism in Turkey

There are several factors effecting the growth of healthcare tourism industry. Among the most important ones are costs, exchange rates, competition, privatization, marketing, costly operations uncovered by insurances (such as dental or plastic surgery), age distribution of the population, timing of appointments, prohibited operations (such as abortion or gender change), care insurance for the senior and the disabled, medical accreditations (İçöz, 2009). Healthcare tourism choices are also influenced by travelling expenses, availability of direct flight routes, geographical proximity, climate, culture and religion (Aslanova, 2013).

Turkey is a popular destination for healthcare tourism with numerous Joint Commission International (JCI) accredited hospitals, with about 60% less cost (TÜRSAB, 2014). Shorter waiting times, opportunity to combine medical travel with a holiday, availability of high technology medical equipment and insurance coverage for medical treatments in Turkey also brings out a competitive advantage (Birdir and Tuzcu, 2014; Özok, 2008; Şahbaz et al., 2012).

According to Turkish Healthcare Tourism Report by Association of Turkish Travel Agencies (TÜRSAB) published in 2014, Turkey mainly offers three types of healthcare tourism services:

- *Medical Tourism*: Medical or rehabilitative treatment of international patients at medical institutions.
- *Thermal Tourism and Medical SPA*: Treatment carried out mostly in hotels along with subsidiary medical massage, mud treatment etc.
- *Tourism for the Senior and the Disabled*: Treatment, care and rehabilitation for the senior and the disabled.

Healthcare tourist profiles choosing Turkey are mostly wealthy Middle Eastern, African or middle class European patients (Çevirme, 2008) who spend around 2000 to 12000 USD per capita (TÜRSAB, 2014) which is almost four times more than that spent by other types of tourists (Bozkurt, 2008). Per capita spending differs significantly between public and private institutions. While average patient spends an average of 9000 USD in public institutions, the average increases to 12000 USD in private counterparts.

The Turkish Ministry of Development has a special interest on healthcare tourism potential of the country and published a section devoted to healthcare tourism in its 10th Development Plan covering the years 2014 to 2018. Table 1 presents the expected income and tourist volume for healthcare purposes, set by the Turkish Ministry of Development. The plan also mentions the objectives of collaboration between related parties, preparation of record keeping and statistical infrastructures, allocation of investment and planning incentives, improvement of personnel in terms of quality and quantity, boosting promotion and marketing for the potential improvements in healthcare tourism (Turkish Ministry of Development, 2014).

Table 1: Turkish Healthcare Tourism Development Plan

Tourism Type and Capacity	2013	2014	2015	2016	2017	2018
Thermal Tourism Bed Capacity	42,000	50,000	60,000	75,000	90,000	100,000
Thermal Tourism Volume	500,000	625,000	780,000	975,000	1,250,000	1,500,000
Medical Tourism Volume	308,500	360,000	435,000	520,000	620,000	750,000
Thermal, Medical and Senior Tourism Income (Billion \$)	2.75	3.40	4.45	5.85	7.60	9.35

Turkey has realized its potential in health tourism industry at a policy making level and has taken big steps to make a leap in the last decade. Goals are set, institutional changes are carried out; plans are made and put in progress. International Health Tourism Congress has been organized since 2008 and Department of Health Tourism operating under the control of Turkish Ministry of Healthcare since 2011 has been founded. Considering that, we aim to contribute to healthcare tourism literature for Turkey by examining the historical data of the industry over years through following methodology.

3. DATA AND METHODOLOGY

This paper aims to analyze historical data on healthcare tourism income in Turkey in order to identify any pattern or trends for providing insight for future. Relying on our objectives, the analysis design is composed of two main parts:

- Analysis on the share of healthcare tourism income in the aggregate tourism income of Turkey
- Investigation of any seasonal effects in the healthcare tourism income of Turkey

To fulfill our first objective, annual tourism and healthcare tourism income data are examined. For the second objective, quarterly healthcare income data are used. The data are extracted from the records of Turkish Statistical Institute (TURKSTAT) (www.turkstat.gov.tr). TURKSTAT claims to have corrected the data for a possible bias which may have been caused by the immigrants entering Turkey related to the conflicts in the

Middle East region. The time frame is 2002 to 2015 where reliable data can be obtained. For simplicity, we limit our approach to income generated by tourism.

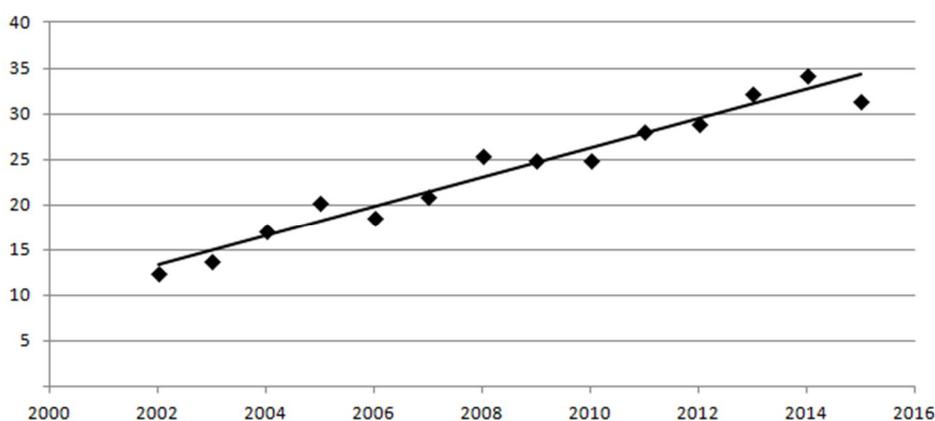
The analyses consist of correlation and regression analyses to bring out annual trends and possible dependencies, chi square goodness of fit tests to analyze the shares of health related income among aggregate tourism income and static forecasting methods with Mean Absolute Percentage Error (MAPE) minimization to check for seasonality. Microsoft Excel is utilized for all empirical analysis and production of figures.

4. FINDINGS AND DISCUSSIONS

4.1. Annual Analysis on the Share of Healthcare Tourism Income in Aggregate Tourism Income

a) Annual Tourism Income: We begin our analysis to obtain a general overview of aggregate tourism income of Turkey. Figure 1 presents the annual tourism income (in million Turkish Liras) for the 2002-2015 periods.

Figure 1: Annual Tourism Income of Turkey between 2002 and 2015



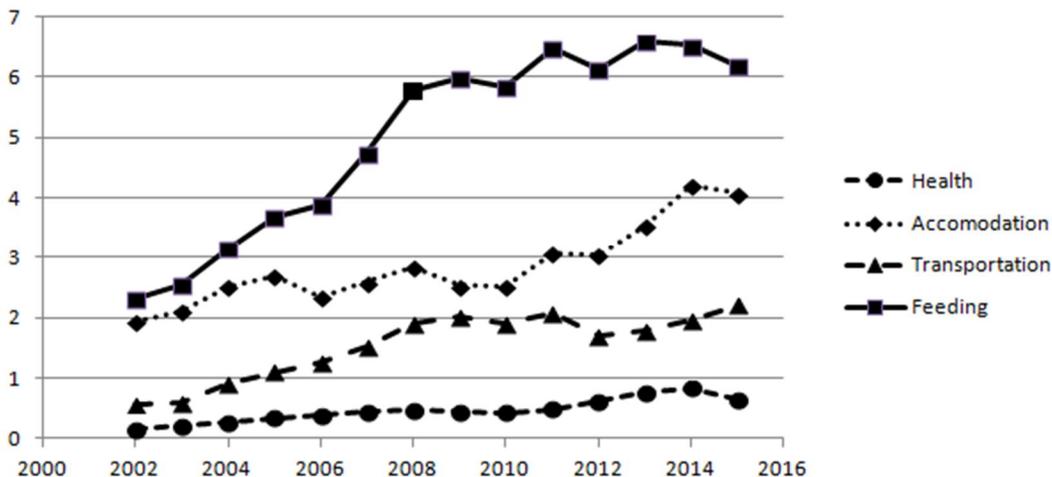
An obvious linear upward trend can easily be noticed in Figure 1. The Pearson Correlation Coefficient is obtained as 0.976 between time and income. This relationship can be expressed as a linear regression model since the numerical data displays a high linear correlation. Such a model yields the below linear equation where AI , Y and ε represent annual tourism income (in million Turkish Liras), year and residuals respectively. The index i represent time. The calculated Mean Absolute Percentage Error (MAPE) for this regression reveals a 5.34% error, which is acceptable.

$$AI_i = 13.42 + 1.6 Y_i + \varepsilon_i$$

Three unanticipated falls in the annual tourism income can be observed in years 2006, 2010 and 2015 from Figure 1. These may coincide with the U.S. based subprime mortgage crisis, European debt crisis and the conflicts in Syria respectively since all turned out to be international crises effecting the Turkish region in a severe manner. Yet, the general linearity assumption does not seem to be weakened under the influence of these events.

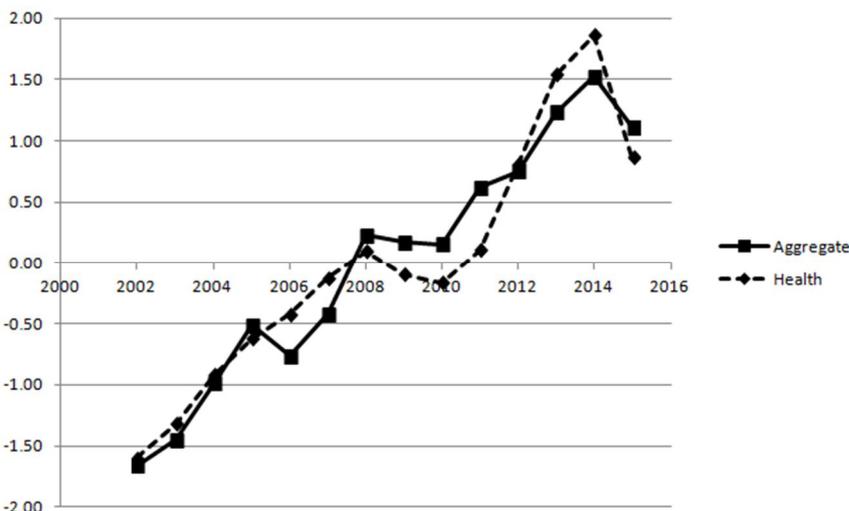
b) Annual Healthcare Tourism Income: Accommodation, transportation and feeding incomes as well as the healthcare tourism income are some of the components of aggregate tourism income. In Figure 2 below, we examine the annual healthcare tourism income (in million Turkish Liras) along with those components of tourism income, which we presume that they may be related.

Figure 2: Annual Income from Healthcare, Accommodation, Transportation and Feeding



As can be readily observed, healthcare tourism has the lowest share among the four; still, it has an upward trend. A closer look at healthcare tourism income and aggregate tourism income presented in Figure 1 reveals that there is a better link between aggregate tourism income and healthcare income rather than the remaining three components of tourism income. Figure 3 presents this fact using normalized (μ/σ) scores of both variables, where annual healthcare tourism income faces two declines at 2010 and 2015 otherwise revealing an overall upward trend. The change in the data is quite similar to the aggregate tourism income but the effects of breaking points defined above (in years 2006, 2010 and 2015) on healthcare tourism income seem to be more intense than the aggregate tourism income.

Figure 3: Normalized Annual Healthcare and Aggregate Tourism Income Data for Turkey



c) The shares: Healthcare tourism income have a correlation of 0.932 with time and 0.963 with annual aggregate tourism income, which points out an almost perfect relationship. Therefore, once the required verifications are presented, it may be possible to suggest that healthcare tourism income have a definable share in and can be presented and forecasted as a percentage of annual aggregate tourism income. Considering that, we present the shares of health income among aggregate tourism income. The share has an average of 1.9% with a standard deviation of 0.35% annually.

4.2. Forecasting the Share of Healthcare Tourism Income with Annual Data

The chi-square goodness of fit tests carried out on both normalized scores and the shares result in a uniform share structure of 1.9% with respective p-values of 0.99 and 1.00. Yet, the trend in the shares has an overall positive direction. These are modelled by linear regression, a power four polynomial regression and a two term moving averages. The three models resulted in 10.48%, 8.33% and 4.44% MAPE values respectively. Therefore, it can be argued that the best way to predict the shares of health among aggregate tourism income is to use an adaptive strategy of moving averages. The share data and the fitted models can be found in Figure 4 and the resulting error terms are depicted in Figure 5.

Figure 4: Share Data and Fitted Models

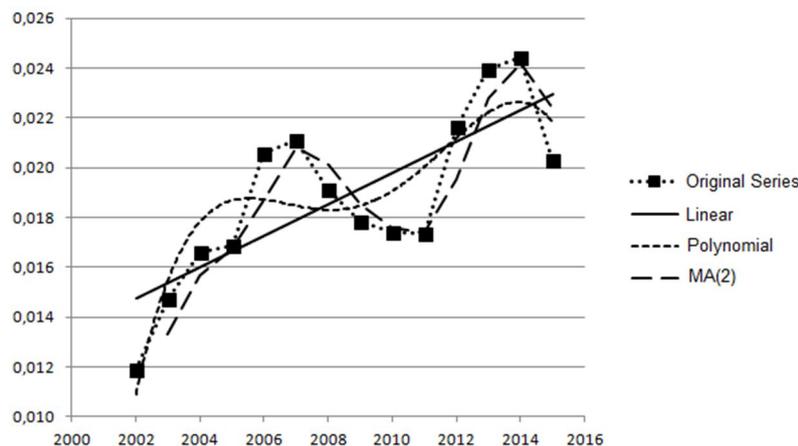
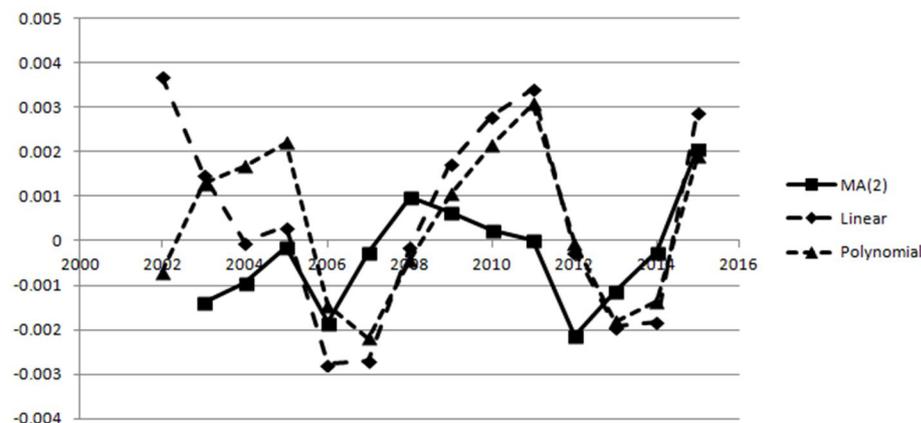


Figure 5: The Error Terms from Fitted Models



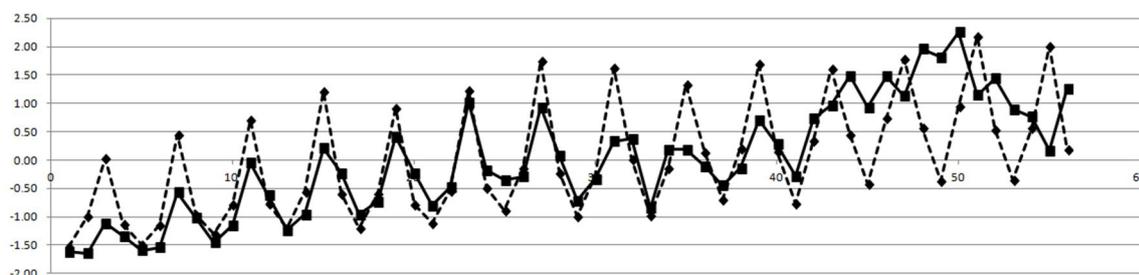
Although the best practice for predicting annual healthcare tourism income share seem to be moving averages approach, still, a linear model can be utilized, for its simplicity in calculation. In addition, moving averages require the assumption of no trend whereas a trend in data is immediately observed. For the polynomial approach it can be argued that a polynomial curve may frequently change direction or tend to rise or fall limitlessly after a critical value. This is a tough assumption to make. Therefore, a linear model would still be valid based on the goodness of fit tests. For this purpose, following linear model without an intercept can be applied to forecast the healthcare tourism income as the share of aggregate tourism income.

$$FC_{health,i} = 0,19 * FC_{agg,i} + \epsilon_i$$

4.3. Investigation of Seasonality in Healthcare Tourism Income with Quarterly Data

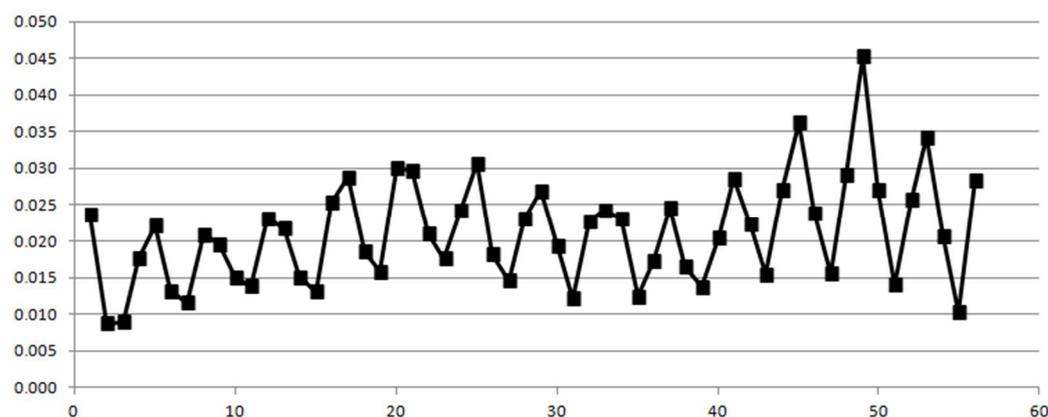
In this section, we aim to fulfill our second objective and investigate seasonality in healthcare tourism income. The existence of seasonality would provide new perspective for forecasting. In this and following sections, quarterly data between 2002 and 2015 are of our interest. In order to avoid scale effect of aggregate and healthcare tourism income, we present both variables using normalization in Figure 6.

Figure 6: Quarterly Aggregate and Healthcare Tourism Income for Turkey between 2002-2015



An upwards trend and a clear seasonality is obvious for the aggregate tourism income (the dashed series with a larger variation) from Figure 6. In terms of healthcare tourism incomes, seasonality seems to be weakened after 2008. At this point, let us also examine the state of the shares of healthcare tourism income in the aggregate tourism income. Figure 7 reveals that the shares have a systematic seasonality pattern with higher values in winter and lower values in summer. The shares for quarterly data reveal a **2.1%** average and **0.73%** standard deviation. The mean value is close to the previous finding with the annual data (1.9%); however, the standard deviation is doubled with the use of quarterly data. This can easily be justified with the fact that Turkey has a high tourism demand during summer, attracting tourists for vacation purposes that may lead to the healthcare tourism shares to fall, followed by a higher deviation in data.

Figure 7: Shares of Health Tourism Income among Aggregate Tourism Income (Quarterly)



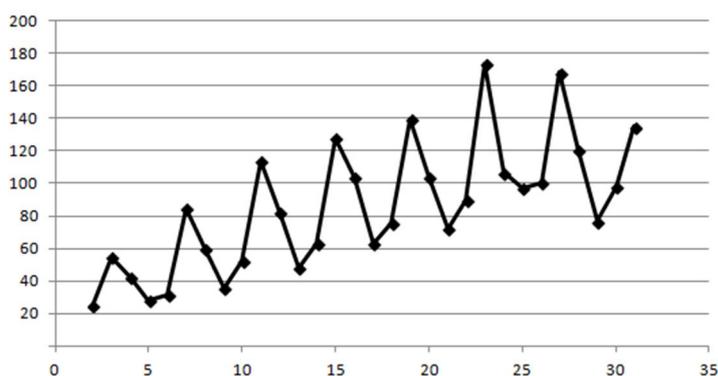
In order to evaluate the changes in the seasonality for healthcare tourism income from 2008 (as observed in Figure 6, we explore the summer to winter ratios of healthcare tourism income and come up with interesting results. Figure 8 presents the summer to winter healthcare tourism income ratios. Until 2008, the summer periods generate significantly larger aggregate income than any other quarters. From this time onwards, the healthcare tourism income has a uniform shape across the quarters. The uniformity begins from 2008 and 2009, followed by a downward trend from 2012. When the Turkish government officially put effort on healthcare tourism beginning from 2008 by voicing a concern and focus and promotion of healthcare tourism, things started to change. The downward trend after 2012 reveals that summer and winter healthcare tourism incomes are approaching to each other, which can mean that efforts on policy making on healthcare tourism pays well.

Figure 8: Summer to Winter Healthcare Income Ratios

4.4. Forecasting the Healthcare Tourism Income with Quarterly Data (2002-2009)

As similar to the annual analysis conducted in sections 4.1 and 4.2, quarterly goodness of fit tests on both normalized scores and the shares result in a uniform share structure of 2.1% in this case and p- values are 0.91 and 1.00, respectively. We can conclude that a certain share is observed throughout the 14-year period. Therefore, it is valid to assert that the healthcare tourism income can be estimated as a portion of aggregate tourism income both in an annual and quarterly manner. There are two cautions to be forwarded still. First, on the aggregate level the effects of global crises shall not be underestimated. Secondly, on the quarterly level the recent health tourism campaign of Turkish government has started to alter the previous demand structure to a more uniform shape. These must be taken into account.

Considering the change in seasonality detected earlier, it would be wise to divide the healthcare income into two parts in order to come up with appropriate forecasts. The first part (2002Q2 to 2009Q3) is given in Figure 9 and the seasonality can easily be detected.

Figure 9: Healthcare Tourism Income Between 2002Q2 to 2009Q3

Except for the triplet around Q25, a clear seasonal structure is present for an eight-year period. We apply a static forecasting methodology incorporating periods (P) to estimate the level (L), trend (T) and seasonal factors (SF). Three models considering additive, multiplicative and mixed functions of those parameters as:

- Additive Model: $FC = L + TxP + SF_Q$ where all parameters are in additional form
- Multiplicative Model: $FC = L \times T^P \times SF_Q$ where all parameters are in multiplicative form
- Mixed Model: $FC = (L + TxP) \times SF_Q$ where only SF is in the multiplicative form

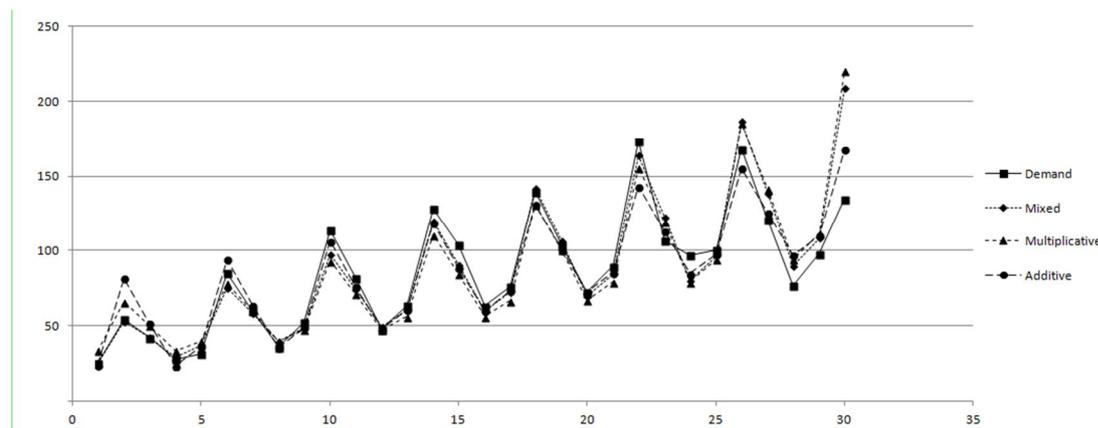
To obtain the forecast parameters L , T and SF , the data is smoothed using moving averages with MA (5) in order to eliminate the seasonal effect. Then, a linear regression (nonlinear in multiplicative model) is applied to obtain L and T . Using the original income with the regression results SF values are calculated and then averaged for forecasting. Forecasts are made and error terms are evaluated to obtain the standard deviations and MAPE values. Our findings for the three methods subject to MAPE minimization are given in Table 2.

Table 2: Static Forecast Results of Healthcare Income Between 2002-2009

Model	Mathematical Representation (in thousands)	Standard Deviation of the Error Terms (in thousands)	MAPE
Additive	$42.8 + 3xP + SF_Q$	12.4	10.4%
Multiplicative	$42.3 \times 1.04^P \times SF_Q$	19.8	15.1%
Mixed	$(27.7 + 3.7xP) \times SF_Q$	16.3	9.4%

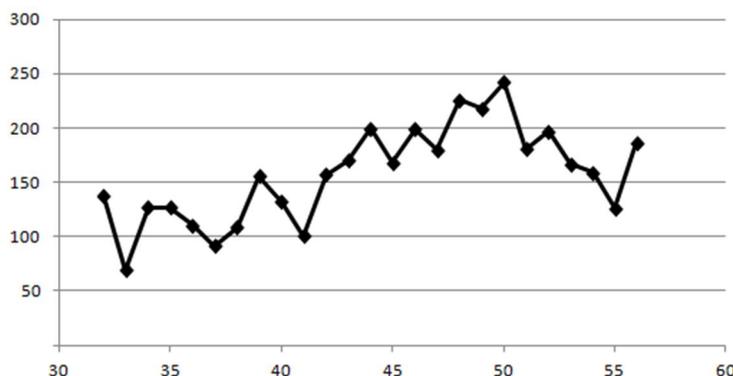
The forecast graphs are presented in Figure 10. Additive and mixed forecasts are fairly acceptable, providing sufficient evidence of a seasonal structure and positive direction in the healthcare tourism income. The additive model adapts to change faster with a smaller variation, whereas the mixed model performs better with a smaller MAPE.

Figure 10: Static Forecasts of Quarterly Health Tourism Income (2002Q2 to 2009Q3)



4.5. Healthcare Tourism Income after 2009

Beginning from 2009, the seasonal structure becomes weaker, before completely disappearing in 2012. Figure 11 shows the remaining data (from Figure 9) where the seasonal structure is broken.

Figure 11: Healthcare Tourism Income Between 2009Q4 to 2015Q4

In 2008, there has been two important developments in Turkey on health tourism. The Department of Health Tourism was first introduced as a competent body and Turkish Ministry of Health debuted the annual International Health Tourism Congress. These advances have aimed to manipulate the healthcare tourism income. The result was an upward trend, later interrupted by the conflicts in Syria, and a more uniform income structure across the quarters (Figure 10). This shift in demand also modified the previous seasonal pattern to a more random shape. The traces of the previous seasonality can still be found between Q32-Q43, which then diminishes to a random fluctuation. Relying on the more recent data, it can be concluded that there are no seasonal patterns in the healthcare tourism income anymore.

5. CONCLUSION

Healthcare tourism is an emerging market open for international competition. The popular destinations are shifting through time and are affected by global affairs. In this study, we examine the case of Turkey aiming to provide insight on past and future of healthcare tourism income of Turkey. The analysis can be thought in two main parts relying on the data: annual and quarterly.

Annual analysis on aggregate and healthcare tourism income data between 2002 and 2015 reveal several observations. First of all, a linear upward trend can be observed in Turkish aggregate tourism income. Secondly, healthcare tourism income has also an upward trend. In addition, healthcare tourism income is significantly correlated with aggregate tourism income, therefore, healthcare tourism income has a definable share in and can be presented and forecasted as a percentage of annual aggregate tourism income. The share of healthcare tourism in aggregate tourism has an average of 1.9% with a standard deviation of 0.35% annually. Finally, the best practice for predicting annual healthcare tourism income share found to be moving averages approach, however a linear model can also be utilized, since moving averages require the assumption of no trend whereas a trend in our data is immediately observed.

Quarterly analysis on aggregate and healthcare tourism income data between 2002 and 2015 indicate following results. An upwards trend and a clear seasonality is obvious for the aggregate tourism income. Healthcare tourism income data reveals seasonality, however, beginning from 2009, the seasonal structure becomes significantly weaker, before completely disappearing in 2012. This corresponds to the time period that the Turkish government officially put effort on healthcare tourism beginning from 2008 by voicing a concern and focus and promotion. Considering the change in seasonality, we can divide the healthcare income into two parts: 2002Q2 to 2009Q3 and 2009Q3 to 2015Q4. We apply three forecast methods subject to Mean Absolute Percentage Error minimization to 2002Q2 to 2009Q3 data where seasonality is observed: additive, multiplicative and mixed models. It is found that mixed model performs with a smaller MAPE. Relying on data after 2009, it can be concluded that there are no seasonal patterns in the healthcare tourism income anymore.

Even though quarterly healthcare tourism income follows a seasonal pattern until 2009, this structure is seemed to be broken in the following periods. Still, the aggregate tourism income continues to exhibit seasonality. Keeping this in mind and the fact that health tourism has a statistically significant and constant

annual share in aggregate tourism income, further research may be carried out by focusing on the quarterly share relationship between the two. In a possible case where such a relationship exists, multiple separate mathematical models can be utilized to obtain a better final forecast.

Overall, Turkey has an increasing healthcare tourism potential strengthening with the realization of this potential by the policy makers. Its share in the aggregate tourism incomes is increasing and becoming smoother over the year. The results of the current paper can provide a strategic insight for macro level decision makers in their decisions on healthcare tourism planning.

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AN APPLICATION OF BENFORD'S LAW TO FUNDAMENTAL ACCOUNTING FIGURES REPORTED BY BORSA ISTANBUL (BIST) COMPANIES

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ABSTRACT

The financial reporting of public firms is argued for being subject to manipulation and fraud. Since adherence to this mysterious law is accepted as a sign for the data's reliability, Benford's Law has long been used by auditors as a tool to test the integrity of a dataset and to detect fraud. The expected distribution of digits in any set of natural numbers has initially been put forward by Benford (1938). Benford's law states that probability distribution of digits' occurrence is not uniform. Smaller digits are found to exist more frequently than the greater ones. This study tested the compliance of fundamental figures reported by Borsa Istanbul (BIST) companies with Benford's Law, by means of a data between 2005 and 2015 covering 148 companies. According to the different testing approaches utilized, which imparted rather similar results, reported figures of current assets and net sales seemed to be almost in perfect conformity with Benford's Law. However, the study detected several deviation points in the data of total assets and net profit figures from Benford's Law. From the results of this study, we cannot conclude that they are extensively manipulative or they are in full conformity with the Benford's Law. Nevertheless, this study suggests the possible point of interest for further researches. In application of Benford's Law non-conformity should be evaluated with discretion. The deviations are only a signal to analyze the data further, and should not be seen as a solid proof of fraud or manipulation.

Keywords: Benford's Law, Borsa Istanbul, manipulation, fraud, financial reporting

JEL Classification: G30, M41, M42

1. INTRODUCTION

Manipulation, fraudulent activities, and flaws in reporting of accounting information have crucial impact on the reliability of financial statements. Correctness of publicized information is vital for well-functioning financial markets as it affects public perceptions. Misperceptions about firms may hinder proper functioning of financial markets resulting in inefficiencies in capital distribution. Stakeholders relentlessly strive to verify the quality of reported data. Accordingly, this study attempts to reveal whether major inputs in a set of published data is manipulated or not, by using Benford's law.

Benford's Law, which is explained in detail in the forthcoming sections, suggests a frequency distribution for digits in any tabulated data. The expected pattern of digit distribution based on this law can be used as a tool to check quality of data. Investigating the conformity of a dataset with Benford's Law can be seen as an auditing technique to detect fraud, errors, and fabrication in any transactional data. In summary, the law can be utilized to uncover the integrity of available data (Nigrini and Miller, 2007). Nevertheless, it is important to emphasize that even though Benford's Law can be used as a tool to test reliability of a dataset, non-conformity should be evaluated cautiously. Non-compliance is not always an indication of deliberate manipulation or human error. It may also stem from the inefficiencies in the generation of data. The deviation should be accepted as a signal to review and analyze the data more closely and should not, therefore, be seen as a solid proof of fraud. The process should be used as an initial tool to detect potential errors and manipulation that may exist in the dataset.

The rest of the paper is organized as follows. The next section reviews the literature on Benford's Law. Section 3 explains the research approach and the data used. The subsequent section sets forth the analyses and the results. The last section concludes and suggests the limitations of the study.

2. LITERATURE REVIEW

The discovery of the phenomenon that the ten digits do not occur with equal frequency dates back to the study of Newcomb (1881). Simon Newcomb, an American astronomer, realized that first pages of books of logarithmic tables wore out much faster than the last pages. The idea that there is an expected distribution of digits in any dataset of natural numbers has been more strongly put forward by Benford (1938). In his study, the percentage of times the natural numbers from 1 to 9 occur in a dataset of more than 20,000 observations was analyzed. The sample covered numerous areas of data some of which can be named as atomic weights, population, river drainage, cost data, and items related to newspapers. He disclosed a tendency of a random nature in numbers. It was discovered that these 'outlaw' or 'anomalous' numbers agreed with logarithmic law. When the probability of occurrence of digits from the logarithmic scale is estimated, it is seen that 30% of the time a randomly selected number begins with 1, and this frequency is found to fall to 4.6% in case of 9. The notion that defines the expected frequency of digits where smaller digits occur more frequently in the first position than larger digits, became known as Benford's law. This characteristic of numbers' distribution fits well with numbers of a random nature, but not with those of a formal or mathematical nature. The below Table 1 shows expected digital frequencies of Benford's Law for the first and second places.

Table 1: The First and Second Place Frequencies of Digits

Digit	First Place	Second Place
0	0.000	0.120
1	0.301	0.114
2	0.176	0.108
3	0.125	0.104
4	0.097	0.100
5	0.079	0.097
6	0.067	0.093
7	0.058	0.090
8	0.051	0.088
9	0.046	0.085

Source: Benford (1938)

An experiment was conducted to test the conformity of invented numbers with Benford's Law in the study of Hill (1988), in which 742 undergraduate calculus students were asked to create six digit random numbers. Digit 1 is found to occur more frequently than digits 8 or 9 in the first place though not in perfect conformity with the Law. Diekmann (2007) evaluated the same matter on both published and fabricated statistical estimates. Benford's distribution was found to conform with the published data. In the test of fabricated data, the subjects, who were students of University of Berne in Switzerland, were asked to construct regression coefficients on a certain hypothesis. Although the distribution of first digit was in line with the predictions of the law, the second digit was found to demonstrate deviation from the expected figures of the law. The conclusion was that rightmost digits in fabricated data demonstrated to be better clues for potential errors.

Durtschi et al. (2004) specified the cases when it would be appropriate to utilize Benford's Law. Accounts that were comprised of numbers resulting from mathematical combinations and accounts that display transactions, large datasets and the cases where the mean was greater than the median with positive skewness were the situations when the law could be applied. In cases where dataset was made up of assigned numbers or when human thought affected the numbers, it was not appropriate to use the law. Furthermore, accounts that were restricted by minimum or maximum values and those that were made of numbers specific to the firm were not

suitable to be tested by the law. Table 2 summarizes the context when Benford's Law is useful and when it has to be applied rather cautiously.

The idea to utilize Benford's Law in compliance research is not new. Some of the initial studies can be named as those of Slemrod (1985) and Nigrini (1996). The idea is to test whether the human element causes the digits of the reported numbers to deviate from expected frequencies. Thomas (1989) tested for the presence of earnings management by utilizing the natural occurrence of digit frequencies in detecting whether managers round earnings numbers to reach their goals.

Table 2: When It is Appropriate to Use Benford's Law

When Benford Analysis is Likely Useful	Examples
Sets of numbers that result from mathematical combination of numbers – Result comes from two distributions	Accounts receivable (number sold * price), Accounts Payable (number bought * price)
Transaction-level data - No need to sample	Disbursements, sales, expenses
On large data sets - The more observations, the better	Full year's transactions
Accounts that appear to conform - When the mean of a set of numbers is greater than the median and the skewness is positive	Most sets of accounting numbers
When Benford Analysis is not Likely Useful	Examples
Data set is comprised of assigned numbers	Check numbers, invoice numbers, zip codes
Numbers that are influenced by human thought	Prices set at psychological thresholds (\$1.99), ATM withdrawals
Accounts with a large number of firm-specific numbers	An account specifically set up to record \$100 refunds
Accounts with a built in minimum or maximum	Set of assets that must meet a threshold to be recorded
Where no transaction is recorded	Thefts, kickbacks, contract rigging

Source: Durtschi et al, 2004, pp.24

Recent studies have been performed on accounting data for detection of fraud as well. Alali and Romero (2013) utilized financial accounting data to observe whether any deviations from Benford's Law exist on U.S. publicly available data for the decade starting at year 2001. Based on the analyses of first and the first-two digits of data in different periods and for different firm sizes, a likely manipulation was detected. Effectiveness of regulations, greater scrutiny, and being audited by Big 4 firms were important factors affecting the degree of manipulation. A concurrent study performed on European publicly listed companies was that of Grabinski and Paszek (2013) which tested selected accounting items; namely, net profit, equity, sales, total assets and profitability ratios generated by these items with respect to their consistency with Benford's Law. The distribution of accounting items was found to be in conformity with the theoretical distribution postulated by the law. A divergence from the law was detected in the case of financial ratios, though it was at an acceptable level for the cases of return on sales and return on equity.

Benford's Law has also been used to test the quality of macroeconomic data announced by governments. Accordingly, Rauch et al. (2011) utilized a data set of public deficit, public debt, and gross national product which was extracted from Eurostat database belonging to 27 EU member states for the period between 1999 and 2009. The findings revealed that, with respect to the first digit, Greece, Romania, Latvia, and Belgium were the countries with the most deviating data from Benford's Law. However, it has to be reiterated that deviation should not be considered as a direct sign of manipulation, it essentially suggests a further investigation in the case of non-conformities. Another study that tested for the conformity of international macroeconomic statistics with Benford's Law was that of Nye and Moul (2007). Analyses were conducted on a dataset of 183 countries together with a further investigation into a subset of OECD countries. Overall the findings showed that while data belonging to OECD countries was consistent with the law, some non-conformities in the GDP figures of developing countries were existed.

Similarly, Data from Borsa Istanbul (BIST) has also been tested for conformity with Benford's Law. A recent study by Cinko (2014) tested the compliance of the returns of stocks listed on BIST-100 between the dates 02.01.1990 and 02.12.2013. When the whole period analyzed using Chi-square statistic, it was seen that the distribution of the returns does not fit with the law. However, when the data was analyzed after being segregated into three periods, only the third period was found to be non-corresponding to the law. The returns' distributions in the first and second periods were found to be in accordance with the law. Gönen and Rasgen (2016) tested the existence of fraud in transactions of three public companies listed on BIST. The volume of transactions belonging to the selected companies was examined by using first digit, second digit and first-two digit tests. Non-conformity to Benford's Law was detected in the company that was suspected of engaging in manipulative activities. Another study utilizing first digit test was conducted on consolidated 2013 first quarter figures of four banks listed on BIST for (Uzuner, 2014). The results of the Chi-square test statistic revealed the accordance of first digit distribution with the law.

It is important to emphasize that even though Benford's Law can be used as an important tool to test the integrity of a dataset, non-conformity should be evaluated with extreme caution. Non-correspondence to Benford's distribution does not always mean that the dataset is deliberately manipulated or any human error is involved, but that, there may exist inefficiencies in the generation of data. The deviation should be accepted as a signal to review and analyze the data more closely and should not, therefore, be seen as a solid proof of fraud. Overall, the process should be used as an initial tool to see whether any potential errors exist in the dataset or in the data transformation process.

3. DATA AND METHODOLOGY

As stated in the previous sections, Benford's Law provides the expected frequencies of the digits in a dataset. It basically claims that smaller digits (like 1, 2, and 3) should be observed more frequently than the bigger digits. Several different approaches are possible for examining compliance of numbers with Benford's Law. Naturally, number set may include negative numbers, however, according to Benford's Law, the first digit is the first non-zero digit. Minus signs should be ignored and the digit following the negative sign should be accepted as the first digit. Benford's law states that the logarithmic pattern in the numbers can be expressed with the probability of observation of each digit in specific location. Thus, the probability of observing a certain number in the first digit is estimated with the following logarithmic equation.

$$P(d) = \log_{10}(d + 1) - \log_{10}(d) \quad d \in \{1 \dots 9\} \quad (1)$$

Equation (1) states that probability of occurrence of digit d is proportional to the space between d and $d + 1$ on a logarithmic scale. In other words, probability of occurrence of two consecutive digits is at equal distance on the logarithmic scale. Equation (1) can be simplified as:

$$P(d) = \log_{10} \frac{d + 1}{d} = \log_{10} \left(1 + \frac{1}{d} \right) \quad (2)$$

Furthermore, the two digit probabilities can be denoted as in Equation (3):

$$P(d_1 d_2) = \log_{10} \left(1 + \frac{1}{d_1 d_2} \right) \quad d_1 d_2 \in \{11, 12 \dots 99\} \quad (3)$$

when probabilities of numbers 12, 22, 32, 4292, are added, the probability of occurrence of 2 as the second digit can be estimated.

Financial reporting of public companies has long been criticized for being exposed to manipulation and fraud. Earnings management has shown to be an important problem affecting the quality and correctness of financial reporting. Many studies verified managers' tendency to manipulate their earnings according to expectations in the market (Hadani et al., 2010; Zahra et al., 2005; Liu, 2005; Koh, 2007). Undisclosed fraud in a firm may also affect the reported figures of the firm. Benford's Law could help to detect the extent of manipulation and fraud within the reported figures.

To demonstrate the reporting quality and the extent of manipulation in BIST, this study tested some of the annually reported fundamental figures for compliance with Benford's Law. In the analysis, 11 years data

(between 2005 and 2015) of 148 non-financial companies is employed. Only the most basic financial reporting figures are chosen for testing namely, net sales, total assets, current assets and net profit/loss. So for each reported figure, 1628 numbers are analyzed for conformity with the Bedford's Law. Chi-square(χ^2) and Z tests are applied to first two digits of data. Also a joint analysis of first two digits is made where results are presented in graphical form.

Table 3: First Digit Frequencies

Digits	Total Assets		Current Assets		Net Profit		Net Sales		Benford's Law
	# of Observations	Frequency	# of Observations	Frequency	# of Observations	Frequency	# of Observations	Frequency	1st digit frequency
1	471	0.2893	513	0.3151	476	0.2924	524	0.322	0.3010
2	330	0.2027	298	0.1830	317	0.1947	294	0.181	0.1761
3	225	0.1382	198	0.1216	202	0.1241	186	0.114	0.1249
4	151	0.0928	156	0.0958	139	0.0854	145	0.089	0.0969
5	138	0.0848	115	0.0706	130	0.0799	116	0.071	0.0792
6	115	0.0706	107	0.0657	109	0.0670	119	0.073	0.0669
7	78	0.0479	75	0.0461	91	0.0559	96	0.059	0.0580
8	76	0.0467	85	0.0522	100	0.0614	82	0.050	0.0512
9	44	0.0270	81	0.0498	64	0.0393	66	0.041	0.0458

Table 4: Second Digit Frequencies

Digits	Total Assets		Current Assets		Net Profit		Net Sales		Benford's Law
	# of Observations	Frequency	# of Observations	Frequency	# of Observations	Frequency	# of Observations	Frequency	2nd digit frequency
0	166	0.1020	196	0.1204	187	0.1149	206	0.127	0.1197
1	201	0.1235	199	0.1222	178	0.1093	199	0.122	0.1139
2	186	0.1143	184	0.1130	180	0.1106	182	0.112	0.1088
3	179	0.1100	158	0.0971	163	0.1001	165	0.101	0.1043
4	157	0.0964	185	0.1136	161	0.0989	155	0.095	0.1003
5	154	0.0946	147	0.0903	156	0.0958	156	0.096	0.0967
6	138	0.0848	138	0.0848	147	0.0903	133	0.082	0.0934
7	143	0.0878	151	0.0928	177	0.1087	155	0.095	0.0904
8	153	0.0940	142	0.0872	132	0.0811	134	0.082	0.0876
9	151	0.0928	128	0.0786	147	0.0903	143	0.088	0.0850

4. FINDINGS AND DISCUSSIONS

Observed proportions of first and second digits and the expected proportions of Benford's Law are given in Table 3 and in Table 4. For several reasons only the compliance of first two digits is tested. First, manipulation in the first digits has the biggest impact on the finally reported figure. Eventually it has the biggest impact on investors' perception of the firm. Secondly, first digits are least affected from rounding. Subsequent digits may be more affected especially from the rounding in provisional figures (Engel, 2011).

4.1. Chi-square Test

To evaluate the observations' compliance with Benford's law, initially chi-square test (χ^2) is utilized. The chi-square test may be used to measure the goodness-of-fit of data at hand to Benford's Law (Nigrini and Miller 2007). Chi-square statistic is calculated as follows:

$$\chi^2 = n \sum_{i=1}^9 \frac{(O_i - P_i)^2}{P_i} \quad \text{for the first digit and} \quad (4)$$

$$\chi^2 = n \sum_{i=0}^9 \frac{(O_i - P_i)^2}{P_i} \quad \text{for the second digit} \quad (5)$$

where n is the number of observations, which is 1628. O_i is the observed frequency of the digit and P_i is the expected frequency of the digit according to Benford's law.

The chi-square statistics are given in Table 5. The p-values are estimated with $df = 8$ (degrees of freedom) for the 1st digit and with $df = 9$ for the 2nd digit.

Table 5: Chi-square Statistics Test Results

	1st Digit		2nd Digit	
	χ^2	P - value	χ^2	P - value
Total Assets	26.8174	0.0008	10.1504	0.3384
Current Assets	7.8143	0.4518	7.8381	0.5505
Net Profit	10.8235	0.2119	8.5444	0.4803
Net Sales	8.2838	0.4063	5.8123	0.7585

According to chi-square (χ^2) test, only the first digit of reported total assets figures indicates a potential non-conformity with Benford's law. The rest of the digits seem to be in harmony with the expected proportions of Benford's law.

4.2. Z-statistic

To further explore the robustness of the results and to detect possible non-conformity in a specific digit, as also suggested by Nigrini (1996) and Durtschi et al.(2004), Z-statistic test is employed. The standard deviation for each digit's expected proportion is estimated with equation (6).

$$s_i = \sqrt{\frac{P_{ei}(1-P_{ei})}{n}} \quad (6)$$

where n is the sample size and P_{ei} is the expected proportion of digit i according to the Benford's Law. Then, the z-statistic is estimated as with equation (7).

$$Z_i = \frac{|P_{oi} - P_{ei}| - \frac{1}{2n}}{s_i} \quad (7)$$

where P_{oi} is the observed proportion of digit i , P_{ei} is the expected proportion of digit i according to Benford's Law. Estimated z-statistic values and the p-values against the null hypothesis that the observed digit is in conformity with Benford's Law are given in Tables 5 and 6.

Table 6: Z-values and P-values of 1st Digits

1st Digit	Si	Total Assets		Current Assets		Net Profit		Net Sales	
		z-value	p-value	z-value	p-value	z-value	p-value	z-value	p-value
1	0.0114	1.0011	0.3168	1.2142	0.2247	0.7309	0.4648	1.8086	0.0705
2	0.0094	2.7854	0.0053	0.7033	0.4819	1.9396	0.0524	0.4430	0.6577
3	0.0082	1.5865	0.1126	0.3626	0.7169	0.0628	0.9500	1.2622	0.2069
4	0.0073	0.5239	0.6004	0.1050	0.9164	1.5293	0.1262	1.0266	0.3046
5	0.0067	0.7858	0.4320	1.2332	0.2175	0.0516	0.9588	1.1415	0.2537
6	0.0062	0.5542	0.5794	0.1402	0.8885	-0.0410	1.0327	0.9510	0.3416
7	0.0058	1.6884	0.0913	2.0065	0.0448	0.3100	0.7565	0.1141	0.9092
8	0.0055	0.7707	0.4409	0.1289	0.8974	1.8156	0.0694	0.0960	0.9235
9	0.0052	3.5641	0.0004	0.7039	0.4815	1.1929	0.2329	0.9558	0.3392

When we assume a significance level of 5% ($\alpha = 0.05$) in the first digit level, digits '2' and '9' in totals assets appear to deviate from Benford's Law (Table 6). When we also assume the same significance level ($\alpha = 0.05$) in the second digit level, digits '0' in the sample of total assets and digit '7' in the sample of net profit seem to diverge from Benford's Law (Table 7).

Table 7: Z-values and P-values of 2nd Digits

2nd Digit	Si	Total Assets		Current Assets		Net Profit		Net Sales	
		z-value	p-value	z-value	p-value	z-value	p-value	z-value	p-value
0	0.0080	2.1638	0.0305	0.0506	0.9597	0.5603	0.5753	0.8141	0.4156
1	0.0079	1.1770	0.2392	1.0210	0.3073	0.5393	0.5897	1.0210	0.3073
2	0.0077	0.6636	0.5069	0.5045	0.6139	0.1861	0.8524	0.3453	0.7299
3	0.0076	0.7014	0.4830	0.9201	0.3575	0.5147	0.6068	0.3526	0.7244
4	0.0074	0.4786	0.6322	1.7489	0.0803	0.1486	0.8818	0.6437	0.5198
5	0.0073	0.2424	0.8085	0.8295	0.4068	0.0747	0.9405	0.0747	0.9405
6	0.0072	1.1511	0.2497	1.1511	0.2497	0.3845	0.7006	1.5771	0.1148
7	0.0071	0.3106	0.7561	0.2945	0.7684	2.5422	0.0110	0.6403	0.5220
8	0.0070	0.8712	0.3837	0.0056	0.9955	0.8824	0.3776	0.7070	0.4795
9	0.0069	1.0775	0.2813	0.8777	0.3801	0.7220	0.4703	0.3665	0.7140

According to the results of both chi-square and z-statistic tests, both current assets and net sales figures seem to perfectly comply with Benford's Law's expected proportions. However, chi-square test hints a possible deviation in reported figures of total assets from the Benford's Law. Z-statistic test implies that, in total assets at the first digit level, the deviation may stem from digits '2' and '9'. On the other hand, at second digit level, z-statistic indicates a possible divergence in the digit '0' of total assets and in the digit '7' of net profit figures. Accordingly, when in-depth analysis of possible manipulation is aimed, one must first examine the reported numbers starting with these digits and the related transactions.

4.3. Joint Analysis of First Two Digits

Most of the prior studies in the field of Benford's Law have focused on first or second digits. However, the joint analysis of first-two digits may also disclose anomalies that would be missed with the sole analysis of the first or second digits (Nigrini and Miller 2007). In this respect, the observed frequencies of first two digits are plotted against the expected frequencies of Benford's Law in Figures 1, 2, 3 and 4. The graphs exhibit the expected frequencies of Benford's Law against the actually observed data. As prior tests also suggested, current assets and net sales figures demonstrate a better matching with Benford's proportions in comparison to total assets and net profit figures. In total assets (Figure 1), the observed data seem to deviate from the expected proportions around 20's and 90's (first 2 digits) which is similar to the implications of Z-statistic tests. In the net sales data, some deviation seems to occur around the first digit of '1' (Figure 4). Although net sales seemed to passed the z-statistic, it barely did so ($p=0.07$ against $\alpha = 0.05$). (Table 5).

Figure 1:
Combined Proportions of First Two Digits
Against Benford’s Law in Total Assets

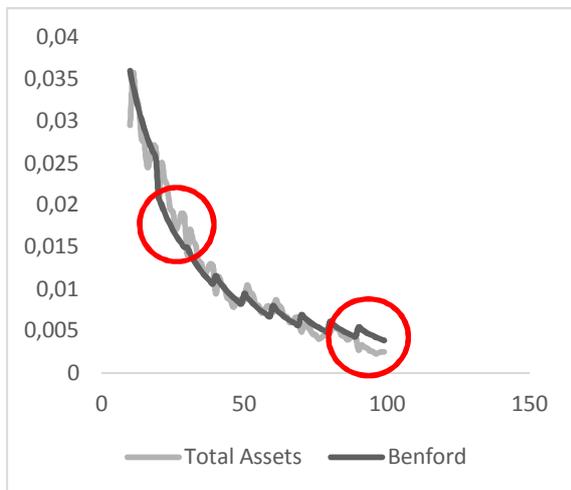
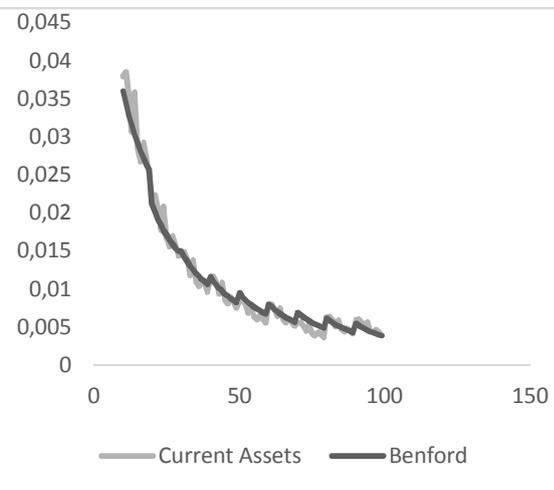


Figure 2:
Combined Proportions of First Two digits
Against Benford’s Law in Current Assets



Although, some deviation is detected from Benford’s Law using the chi-square and z-statistic tests, in general, major financial figures reported in BIST seem to be quite in accordance with the Bedford’s Law. Small deviations disclosed do not lead to the conclusion that the reported figures are subject to substantial manipulation or fraud. However, when further investigation is required, the numbers which have to be analyzed in-depth initially, should be the ones which are indicated by this analysis. The different approaches adopted here found to be inter-changeably applicable. They seem to identify same deviation points in most cases.

Figure 3:
Combined Proportions of First Two Digits
Against Benford’s Law in Net profit

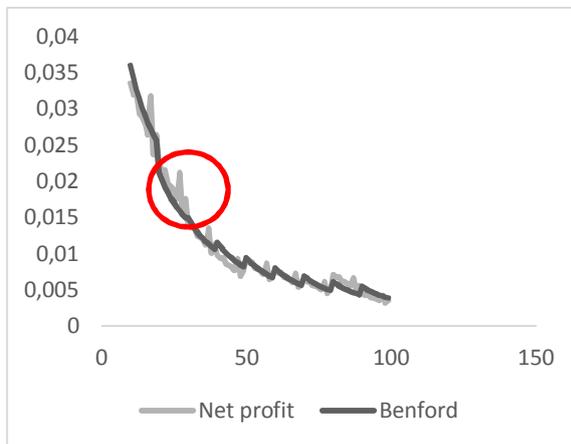
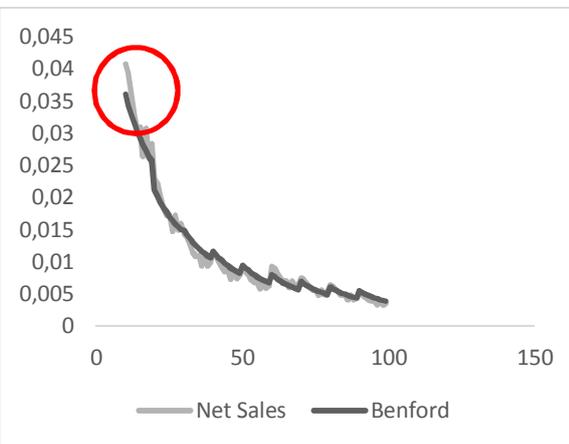


Figure 4:
Combined Proportions of First Two Digits
Against Benford’s Law in Net Sales



5. CONCLUSION

Benford’s Law gives the expected frequencies of the digits in any numerical data, and it is widely used for testing the reliability of accounting information. It is applicable to diverse set of financial data and frequently used by the auditors to detect fraud, manipulation or fabrication in the accounting data. However, Benford’s Law does not prescribe a sure way to detect fraud or manipulation, rather it pinpoints problem areas which may potentially be manipulative data. It is a useful tool to help identify some numbers for in-depth analysis. It

simply narrows the dataset by detecting the data falling outside of expected pattern, which should be thoroughly examined.

The financial reporting of firms has long been known to be subject to manipulation and fraud. This paper aimed to measure the compliance of fundamental figures reported by BIST companies with Benford's Law. According to the different assessment approaches utilized for the first two digits, namely chi-square (χ^2) test, Z-test and joint analysis of first two digits, reported figures of current assets and net sales between 2005 and 2015 seemed to be almost in perfect conformity with Benford's Law. However, analysis detected several deviation points in the data of total assets and net profit figures from Benford's Law. The analyzing methods applied in this study certainly do not lead into the strong conclusion that they are extensively manipulative or they are in full conformity with Benford's Law, they only suggest the point of interest for further researchers. Only a deeper analysis, probably at the transaction level, may disclose actual gaming of the data, if it actually exists.

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A COMPARISON OF BID-ASK SPREAD PROXIES: EVIDENCE FROM BORSA ISTANBUL FUTURES

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ABSTRACT

We analyze the performance of five different methods appearing in the market microstructure literature in predicting effective and quoted bid-ask spreads (Roll, LOT Mixed, Effective Tick, High-Low and Closing Percent Quoted Spread proxies). With data from index futures, currency futures and gold futures traded in Borsa Istanbul and taking percent effective and percent quoted spreads obtained from intraday trade and quote data as benchmarks, we calculate and compare the correlations and root mean square errors of the spread measures. Results show that none of the proxies is successful enough in estimating effective or quoted spread although under normal market conditions, Effective Tick appears to perform best.

Keywords: bid-ask spread, Borsa Istanbul, futures market

JEL Classification: G10, G14, G23

1. INTRODUCTION

Market liquidity or transactional liquidity is simply defined as the ability of trading large sizes quickly at a low cost. Today, for an investor generally it is not possible to invest without taking market liquidity into consideration since it is one of the critical features showing market quality.

Market liquidity concept is broad and includes depth, ex-post volume, cost of a round trip and resiliency dimensions among others. Cost dimension of market liquidity is measured by the difference between the bid and ask prices called "bid-ask spread". The price cost of a round trip originating from an immediate purchase and sale of a security, bid-ask spread, has thus been of great concern in market microstructure research and closely followed by investors and market authorities. Therefore, understanding bid-ask spread dynamics is beneficial for all market participants.

Withstanding the importance of spread, there are several studies that explain spread dynamics over time or its time-series determinants. However, existing studies of bid-ask spread analysis have all been performed over short time periods such as a year or a few months. The reason for this is computational difficulties and more importantly the lack of long-term intraday data. In order to compute either quoted or effective bid-ask spread for long periods, large sets of high-frequency (mostly tick-by-tick) data that consist of quotes and trades are needed. In most cases, intraday data do not go back more than a few years. However, one might be interested in analyzing market liquidity for several years and on various international markets. Thus, this kind of analysis requires extensive amounts of high-frequency data which usually are unavailable (especially in emerging markets) or hard to work with. Instead, if average bid-ask spread can be estimated with readily available low-frequency data such as daily price or volume, this can allow for the investigation about liquidity for much longer time periods.

In effect, measurement of bid-ask spread using alternative low frequency data is an interesting question. Hence, in this paper we focus on how bid-ask spread could be approximated in the absence of real data. Microstructure literature proposes models that attempt to estimate bid-ask spread using low-frequency or other data. In this study, we evaluate the performance of the models proposed in literature on an emerging market.

Roll (1984) is first to estimate bid-ask spreads from observed price movements. Roll approach is attractive since it gives an estimate using just price data. However, it is criticized since its performance is poor when longer term data are used. Thus, starting from popular Roll (1984) measure, various new models have been proposed. Lesmond, Ogden and Trzcinka (1999) develop “Zeros” measure to estimate transaction costs using only the time series of daily security returns which outperforms Roll measure. Their method is based on the idea that lower liquidity is a result of zero volume thus zero return days (Goyenko, Holden, & Trzcinka, 2009). Their bid-ask spread measure is defined as the proportion of zero return days to total trading days in a month. Thus, their percent cost proxy shows monthly liquidity rather than daily liquidity. By the same token, they launched a new measure called LOT Mixed based on the relationship between trading costs and observed stock returns. They state that observed stock returns can change due to buying and selling costs and their liquidity proxy is simply the difference of buying and selling costs. Furthermore, they indicate that true return of a stock is unobserved and these unobserved returns can be estimated by a market model. Using these relations, they estimate cost parameters by maximizing the likelihood function of daily stock returns. Hasbrouck (2004 and 2009) estimates effective costs of trading with a Gibbs procedure. The study uses Roll model and assumes that public information in the model is distributed normally. In fact, we can argue that both LOT Mixed and Hasbrouck measures are useful low-frequency spread proxies but require iterative and computer-intensive calculations. Holden (2009) develops an extended Roll model. This model is a more implicit version of Roll since it takes the idiosyncratic adjusted price change by generating a market model. Developed by Holden (2009) and Goyenko, Holden and Trzcinka (2009), Effective Tick estimator assumes that the relation between spreads and effective tick sizes help researchers infer spreads from price clustering. This spread proxy is simply the probability weighted average of each effective spread size divided by average price. Recently, Corwin and Schultz (2012) generate a new spread proxy using daily high and daily low prices. More recently, Chung and Zhang (2014) suggest a percent-cost proxy called ‘Closing Percent Quoted Spread’ using closing ask and closing bid prices and show that it performs better for U.S. data. Fong, Holden and Trzcinka (2014), generate a new monthly spread proxy called FHT which is a simplified version of LOT Mixed.

A wide variety of researchers have used these low frequency estimators in their analysis. However, the question is whether low-frequency spread proxies really measure what researchers want to measure. This questioning is essential since inaccurate estimates of spreads can create misleading information about actual market liquidity and functioning of financial markets. Therefore, throughout our paper we test the hypothesis that low-frequency measures can usefully estimate bid-ask spread and try to determine the measures that fit best.

So far, several studies in the literature have tested the performance of these low-frequency spread estimators on stock markets. For instance, Lesmond (2005) tests the LOT Mixed proxy to provide liquidity estimates for thirty one emerging markets for a period from 1991 to 2000. The study finds that estimates are more than 80% correlated with the proportional bid-ask spread recorded for twenty three of thirty one markets. Goyenko, Holden, and Trzcinka (2009) compare TAQ-based effective spread with various low-frequency liquidity measures using a sample of 400 randomly selected stocks over the period from 1993 through 2005. They show that the simplest dominant measure is the Effective Tick among Holden, Gibbs, LOT Mixed, Zeros and Roll proxies. Corwin and Schultz (2012) compare Roll, Effective Tick, LOT Mixed and High-Low estimators with NYSE data from 1993 through 2006. Their results show that High-Low spread estimator dominates Roll and LOT estimators and does better than Effective Tick estimator for most stocks. Chung and Zhang (2014) test Closing Percent Quoted spread for US data and find that it performs better than Roll, Effective Tick, Gibbs and Zeros. The most comprehensive study is done by Fong, Holden and Trzcinka (2014). They calculate a variety of liquidity proxies including newest Closing Percent Quoted and High-Low proxy for forty three exchanges around the world and test the performance of these proxies by comparing with daily liquidity benchmarks calculated

from intraday data. They find that Closing Percent Quoted Spread and High-Low estimator show the best performance.

In our paper, we compare the performance of commonly used Roll (Roll, 1984), LOT Mixed (Lesmond, Ogden and Trzcinka, 1999), Effective Tick (Goyenko, Holden, and Trzcinka, 2009; and Holden, 2009), High-Low (Corwin and Schultz, 2012) and Closing Percent Quoted Spread (Chung and Zhang, 2014) proxies in an emerging market. Furthermore, we conduct our analysis on futures contracts. As stated above, while few studies test all these liquidity proxies' performance for stocks, not much is known about liquidity proxies' performance for futures contracts. An exception is Schestag et al (2016) who thoroughly compare liquidity proxies in US corporate bond market. They indicate that most low-frequency proxies based on daily data measure transaction costs well. Our study bears resemblance to this paper but we provide evidence on futures market from Turkey and our results partially differ.

In fact, we have a good reason for studying futures contracts rather than stocks. Tick sizes in Borsa Istanbul stock market are so high that the bid-ask spread is almost always one tick for most stocks and changes very rarely. So, we believe making such an analysis makes more sense in futures market rather than stock market in the case of Borsa Istanbul. Moreover, with this comprehensive assessment, we will have evidence from a different market perspective.

We test the performance of these daily low-frequency spread measures by comparing correlations and root mean square errors with our benchmark spread data that are collected intradaily for selected futures contracts. At daily frequency we expect the estimator to closely approximate spread benchmarks. However, results show that none of these low-frequency spread proxies comes out with a desirable approximation level. Yet, Effective Tick proxy appears to perform better than others in the presence of normal market conditions and captures the time series variation both for effective and quoted spreads. We conclude that better low-frequency effective spread proxies are needed.

The remainder of the paper is organized as follows. Section II explains the high-frequency spread benchmarks and low-frequency spread proxies. Section III describes the data and methodology. Section IV presents our empirical results, and Section V concludes.

2. SPREAD MEASURES

This section presents high-frequency spread benchmarks and low-frequency spread proxies used in our research.

2.1. HIGH-FREQUENCY SPREAD BENCHMARKS

Spread can be defined in several ways. Quoted spread is simply the difference between bid and ask prices at any time in the market. In its turn, effective spread is the difference between trading price and mid-point of the bid-ask spread (also called mid-price). Taking into account large transactions walking through the book, hidden orders or internalization of orders by market makers, effective spread usually is considered to be a more realistic indicator of market liquidity than quoted spread. Two of the most common measures of market liquidity are relative (percent) effective spread and relative quoted spread. These are defined below.

Let Bid_t be the bid price, Ask_t be the ask price, $Midpoint_t$ be the midpoint of the prevailing bid and ask quotes and P_t be trade price at time t . The percent effective and quoted spreads are defined as:

$$Percent\ Effective\ Spread_t = 2 * |(P_t - Midpoint_t)| / Midpoint_t \quad (1)$$

$$Percent\ Quoted\ Spread_t = (Ask_t - Bid_t) / Midpoint_t \quad (2)$$

2.2. LOW-FREQUENCY SPREAD PROXIES

Low-frequency spread proxies include Roll (Roll, 1984), LOT Mixed (Lesmond, Ogden and Trzcinka, 1999), Effective Tick (Goyenko, Holden, and Trzcinka, 2009; and Holden, 2009), High-Low (Corwin and Schultz, 2012) and Closing Percent Quoted Spread (Chung and Zhang, 2014). These are defined and discussed below.

2.2.1. ROLL

Roll (1984) developed an estimator of the effective spread based on observed price changes. His effective spread estimation methodology depends on the idea that the true value of the stock price follows a random walk and in an efficient market the bid-ask spread fluctuates randomly around the true price. Thus, effective bid-ask spread can be inferred from the first-order serial covariance of price changes. Under these conditions, subsequent price changes yield negative expected autocorrelation. So, effective spread estimator is defined as follows:

$$\text{Roll} = 2\sqrt{-\text{Cov}(\Delta P_t, \Delta P_{t-1})} \quad (3)$$

When serial covariance is positive, the formula in equation (3) is undefined. So, this measure was modified by Goyenko et al. (2009) as follows.

$$\text{Roll} = \begin{cases} 2\sqrt{-\text{Cov}(\Delta P_t, \Delta P_{t-1})} / \bar{P} & \text{when } \text{Cov}(\Delta P_t, \Delta P_{t-1}) < 0 \\ 0 & \text{when } \text{Cov}(\Delta P_t, \Delta P_{t-1}) > 0 \end{cases} \quad (4)$$

Roll approach is attractive since it gives an estimate by using price data only. However, this model is criticized by researchers because its performance is poor when longer term data are used since the covariance of price changes is frequently positive for long term.

2.2.2. LOT MIXED

Lesmond, Ogden and Trzcinka (1999) developed a new measure called *LOT Mixed* that depends on the relation between trading costs and observed stock returns. The authors argue that observed stock returns change due to buying and selling costs. The unobserved return of a stock j on day t (R_{jt}^*) can be estimated by the following market model where R_{mt} is the market return.

$$R_{jt}^* = \beta_j R_{mt} + \varepsilon_{jt} \quad (5)$$

Let $\alpha_{1j} < 0$ denote the cost of selling and $\alpha_{2j} > 0$ the cost of buying. The observed return on day t is given by:

$$R_{jt} = \begin{cases} R_{jt}^* - \alpha_{1j} & \text{when } R_{jt}^* < \alpha_{1j} \\ 0 & \text{when } \alpha_{1j} < R_{jt}^* < \alpha_{2j} \\ R_{jt}^* - \alpha_{2j} & \text{when } R_{jt}^* > \alpha_{2j} \end{cases} \quad (6)$$

The LOT Mixed liquidity proxy is simply $\alpha_{2j} - \alpha_{1j}$.

Using these relations, they estimate cost parameters by maximizing the likelihood function of daily stock returns with respect to α_{1j} , α_{2j} , stock's market sensitivity β_j and return volatility σ_j .

2.2.3. EFFECTIVE TICK

Holden (2009) as well as Goyenko, Holden and Trzcinka (2009) jointly developed an effective spread proxy based on the observable price clustering. To calculate the effective spread, first, for each possible spread s_j , the probability of price clustering (F_j) is calculated as follows.

$$F_j = \frac{N_j}{\sum_{j=1}^J N_j} \text{ for } j = 1, 2, \dots, J \quad (7)$$

where N_j is the number of the trades on prices corresponding to the j th spread. Then, the unconstrained probability of the effective spread is defined as:

$$U_j = \begin{cases} 2F_j, & j = 1 \\ 2F_j - F_{j-1}, & j = 2, 3, \dots, J - 1 \\ F_j - F_{j-1}, & j = J \end{cases} \quad (8)$$

Further, they add the following constraints to generate proper probabilities.

$$\hat{y}_j = \begin{cases} \text{Min}[\text{Max}\{U_j, 0\}, 1], & j = 1 \\ \text{Min}[\text{Max}\{U_j, 0\}, 1 - \sum_{k=1}^{j-1} \hat{y}_k], & j = 2, 3, \dots, J \end{cases} \quad (9)$$

Finally, effective tick measure is simply the probability weighted average of each effective spread size divided by average price \bar{P} as shown below.

$$\text{Effective Tick} = \frac{\sum_{j=1}^J \hat{y}_j s_j}{\bar{P}} \quad (10)$$

2.2.4. HIGH-LOW SPREAD ESTIMATOR

Corwin and Schultz (2012) proposed a new measure simply by using daily high and low prices. They state that daily high (low) prices are almost always buyer-initiated (seller-initiated) trades. Therefore, the ratio of the high to low prices reflects both the fundamental volatility of stock and its bid-ask spread. They add that variance component grows proportionally with time period while spread component does not. Thus, high-low ratios estimated over a two-day period should have a variance that is twice the variance over a one-day period. This fact helps them to create an innovative high-low spread. Their effective spread estimator is given as follows:

$$S = \frac{2(e^\alpha - 1)}{1 + e^\alpha} \quad (11)$$

where

$$\alpha = \frac{\sqrt{2\beta} - \sqrt{\beta}}{3 - 2\sqrt{2}} - \sqrt{\frac{\gamma}{3 - 2\sqrt{2}}} \quad (12)$$

The beta (β) and gamma (γ) values in equation (12) are obtained from daily high and low prices and defined as:

$$\beta = \sum_{j=0}^1 \left[\ln \left(\frac{H_{t+j}}{L_{t+j}} \right) \right]^2 \quad (13)$$

$$\gamma = \left[\ln \left(\frac{H_{t,t+1}}{L_{t,t+1}} \right) \right]^2 \quad (14)$$

where $H_{t,t+1}$ and $L_{t,t+1}$ are highest and lowest prices over a two-day period, respectively.

This low-frequency spread measure allows the study of liquidity over relatively long periods of time since only daily high and low prices are needed and these are easily available even in long-term historical data. The estimator is easy to calculate and the authors claim that it performs better than other spread proxies, i.e. it results in higher correlations with spread benchmarks. In their study, they state that this measure performs better in U.S. data than any other proxy. Further, the estimator is not limited to daily data but can be applied to intraday data when the quote data are unavailable or trades cannot be reliably matched with the quotes.

2.2.5. CLOSING PERCENT QUOTED SPREAD

Chung and Zhang (2014) suggest a percent-cost proxy called Closing Percent Quoted Spread using closing ask and bid prices. Their effective spread proxy is simply calculated as follows:

$$\text{Closing Percent Quoted Spread} = \frac{(\text{Closing Ask}_t - \text{Closing Bid}_t)}{(\text{Closing Ask}_t + \text{Closing Bid}_t)/2} \quad (15)$$

The main criticism about this proxy is that it only considers the closing moment of the day leaving out all the intraday spread patterns.

3. DATA AND METHODOLOGY

Using a sample of futures data from Borsa Istanbul Futures and Options Market (VIOP) through March 25 to August 25, 2014 (98 trading days), we first calculated our benchmarks. We work on three contracts: BIST 30 Index future contract (Index Future), USDTRY future contract (Currency Future) and USD/OUNCE Gold future

contract (Gold Future). These are the most heavily traded futures contracts and represent approximately %98 of trading at that time. In VIOP, contracts with three different expiration months are traded; we only take the nearest-to-maturity contracts since these are the most liquid.

VIOP is a fully automated market. It operates continuously from 9:15 am to 17:45 pm. A lunch break exists for equity derivatives from 12:30 to 13:55. As an example, there are on average 20,000 timestamp records daily for the index future. However, other contracts are not that liquid; only 3000 records for currency future exist on the same screen page and only 200 records for gold future.

We calculated effective and quoted bid-ask spreads from the tick-by-tick quote and transaction data as trades occur for 98 trading days from Thomson Reuters Eikon trade and quote screen page. We record data as trades occur and end up with 2,210,695 data points for index future contract, 196,161 data points for currency future contract and 18,131 data points for gold future contract. Our high-frequency dataset differs from periodic datasets since it relies on price observation drawn at variable time intervals.

In our analysis, we first constructed our high-frequency bid-ask spread benchmarks by calculating percent effective and quoted spreads¹ from intraday data. At each moment of transaction in each contract, we determined quoted spread using Equation (2) and then calculated the time-weighted average for a day. The quoted spread is the implicit cost of trading when a trade occurs at the quoted price. In order to measure the spread beyond the quoted bid-ask prices, we also calculated the effective spread at each moment of transaction in each contract as shown in Equation (1) and then calculated the average effective spread for the day.

In addition to our high-frequency benchmarks, we calculated each low-frequency spread estimator mentioned in 2.2 (Roll, LOT Mixed, Effective Tick, High-Low and Closing Percent Quoted Spread).

Following the literature (Corwin & Schultz, 2012; Fong, Holden, & Trzcinka, 2014; Goyenko et al., 2009), we identified certain criteria in order to assess the measurement performance of the low frequency spread estimators. These are time series correlation (tested as well for significance²) and root mean square errors (RMSE).

4. FINDINGS AND DISCUSSIONS

Table 1 provides the summary statistics for the estimators considered in this paper. For comparison purposes, Effective Spread and Quoted Spread (the benchmarks) are presented first. Simple average effective spreads are 0.0361%, 0.0352% and 0.1441% and time-weighted quoted spreads are 0.0281%, 0.0274%, 0.1019% for index, currency and gold futures, respectively. A comparison of the left and right sides of the table reveals that a majority of proxies underestimate effective and quoted spreads (for example, mean values of Roll, Effective Tick and High-Low respectively are 0.0137%, 0.0264% and 0.0168% in index futures while effective and quoted spreads are 0.0361% and 0.0281%, respectively). However, LOT Mixed and Closing Percent Quoted Spread overestimate index future spreads (0.0535% and 0.1772% vs. 0.0361%) and currency future spreads (0.0398% and 0.4849% vs. 0.0352%). For gold future, Lot Mixed largely underestimates spreads (0.0116% vs. 0.1441%) while Closing Percent Quoted Spread overestimates them (0.8305% vs. 0.1441%). In this preliminary analysis, out of all the proxies, the values of Effective Tick generally are the closest to the benchmarks.

¹Note that percent quoted spread is based on displayed quotes, so it represents the hypothetical cost of trading. By contrast, percent effective spread depends on the real trade price occurring in the market, so it represents the actual, round-trip-equivalent cost of trading to the investor. (See Holden 2014 and Holden et al. 2014)

²For an estimated correlation r , Groebner et al. (2008) propose in Chapter 14 testing the significance with $t = \frac{r}{\sqrt{\frac{1-r^2}{n-2}}}$ where n is the sample size.

In order to see the spread patterns over time, we plot in Figure 1 and Figure 2 daily effective and quoted spreads (the benchmarks) for the entire period. Both charts indicate that the level and the volatility of gold futures spreads are considerably higher than index and currency futures.

Table 2 presents results about the correlation between the benchmarks and the spread estimates. A clear result is that Effective Tick has the highest correlation coefficients in all the futures except one (the correlation coefficient between effective spread (respectively quoted spread) and Roll's measure is 41% (43%)). Moreover, coefficients are fully significant in Effective Tick, partially significant in Roll and High-Low and almost insignificant in Closing Percent Quoted Spread and LOT Mixed proxies. The average coefficient of correlation between Effective Tick proxy and effective (quoted) spread benchmark is 47% (66%). This implies that Effective Tick is more successful in predicting quoted spread rather than effective spread. Another interesting result is the relatively low coefficients in currency futures. For instance, as far as quoted spread is concerned, the coefficients of Effective Tick are as high as 73% and 84% in index and gold futures, but only 40 % in currency futures.

The root mean square errors (RMSE) between the benchmarks and proxies that help determine whether the relevant proxy captures the level of the benchmark are given in Table 3. In general, Effective Tick has the lowest RMSE in all the futures indicating its relatively good performance. However, one should notice that there is a large gap between the RMSE of effective and quoted spreads. RMSE are very high in effective spreads compared to quoted spreads. Especially in currency futures, the performance of Effective Tick is not really different from the performance of other proxies.

Results show that none of the proxies is successful enough in estimating effective or quoted spread. This is in contrast to the evidence found by Schestag et al (2016). Nevertheless, under normal market conditions, Effective Tick appears to perform best. This evidence is in line with Goyenko, Holden, and Trzcinka (2009) comparative study while contradictory with Corwin and Schultz (2012) and Fong, Holden and Trzcinka (2014) comparative studies for stocks.

5. CONCLUSION

Understanding market liquidity is critical for understanding market efficiency, functioning and stability. However, studying long-term dynamics of liquidity via bid-ask spreads requires extensive intraday datasets which are usually hard to obtain, especially for emerging markets and long periods. These large datasets bring about a computational burden as well. Thus, some easy-to-calculate proxies that capture the behavior of bid-ask spreads can facilitate this attempt.

In effect, measurement of bid-ask spread using alternative low-frequency data has recently become an interesting question in the literature. Our paper provides research on how one can precisely measure spreads if intraday data are not available. In this attempt, we calculate five daily low-frequency effective spread proxies that exist and most popularly used in the literature (Roll, LOT Mixed, Effective Tick, High-Low and Closing Percent Quoted Spread) and compare their performance. A good proxy should capture well the level and time-series variation of the actual intraday spread with some low-frequency data and computational ease. Each of these proxies has some advantages and disadvantages. For example, LOT Mixed proxy requires a computer-intensive process. For Roll measure, we need tick-by-tick price data which may be hard to obtain. Similarly, Effective Tick proxy requires estimations about intraday prices and intraday spreads. In their turn, High-Low and Closing Percent Quoted Spread proxies require simpler datasets and are easy to calculate. However they usually perform poorly.

Our investigation about the performance of these proxies on index, currency and gold futures trading on Borsa Istanbul Futures and Options Market (VIOP) yields interesting results. For example, Effective Tick proxy appears to perform better than others. More specifically, its correlation with time-weighted quoted spread is satisfactorily high as far as index and gold futures are concerned (73% and 84%, respectively) whereas as far as currency futures are concerned, the correlation falls to 40%. Moreover, the correlation coefficients in the relation between Effective Tick proxy and effective spread are 32%, 33% and 78% for index, currency and gold futures, respectively. Although all these correlations of Effective Tick are statistically significant, they are not

high enough to rely on as an indicator of liquidity. Generally speaking, the overall performance of other proxies is even weaker. The analysis of the root mean square errors (RMSE) points out to similar results.

Although controversial and highly criticized, Roll measure performs relatively well. Its correlations with the benchmarks are higher than LOT Mixed or Closing Percent Quoted Spread proxies and to a lesser extent High-Low proxy.

Results also show that the level and the volatility of gold futures spreads are higher than index and currency future spreads. This is not surprising since index and currency futures are much more liquid than gold futures.

In this study, our aim is to contribute to the literature by identifying the estimator that performs best in predicting actual spreads for futures market. We compare five proxies to the spreads calculated directly with high-frequency data. Our findings show that bid-ask spread estimates are thoroughly biased. Imprecise market liquidity estimates can create misinformation about actual spread dynamics. Thus, we conclude that one should be cautious in using these proxies proposed in the literature. Moreover, a detailed check is necessary about method suitability to market type, market specific regulations (e.g. tick size) and instrument-specific features before starting any study.

The most important direction for further research may be about finding more robust proxies of bid-ask spreads that work with low-frequency data and keeping computational ease. Besides, spread estimation for other markets may bring about different results.

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Figure 1: Effective Spread Pattern

The chart gives the daily percent average effective spread in index and currency futures (left axis) and gold futures (right axis).

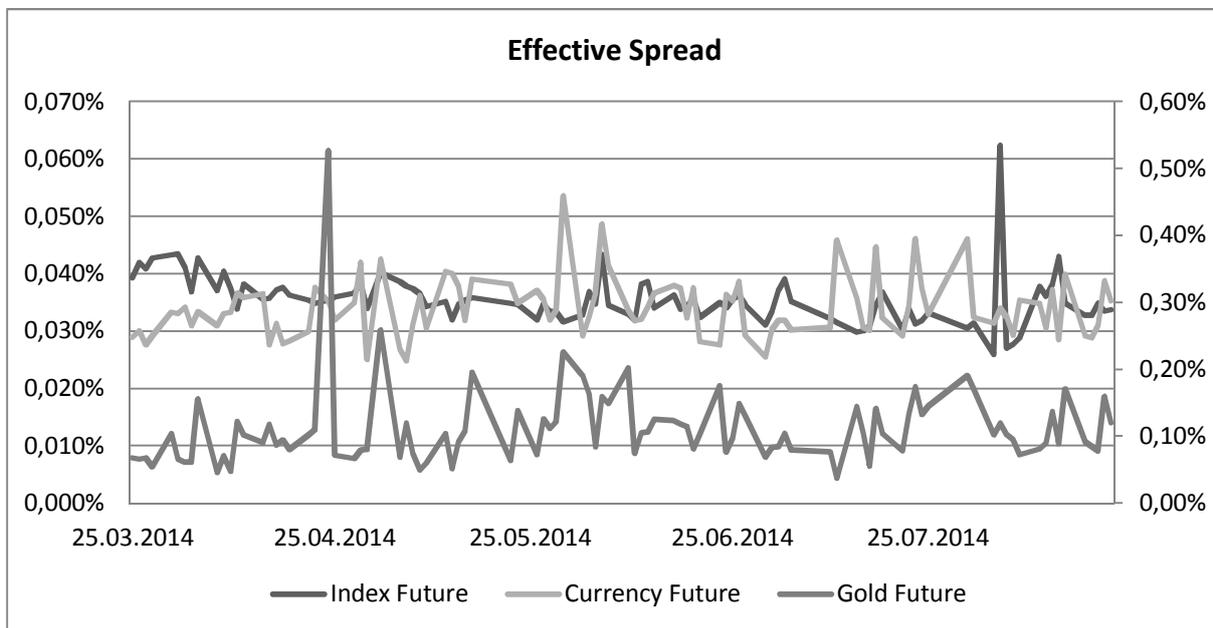


Figure 2: Quoted Spread Pattern

The chart gives the daily percent time-weighted quoted spread in index and currency futures (left axis) and gold futures (right axis).

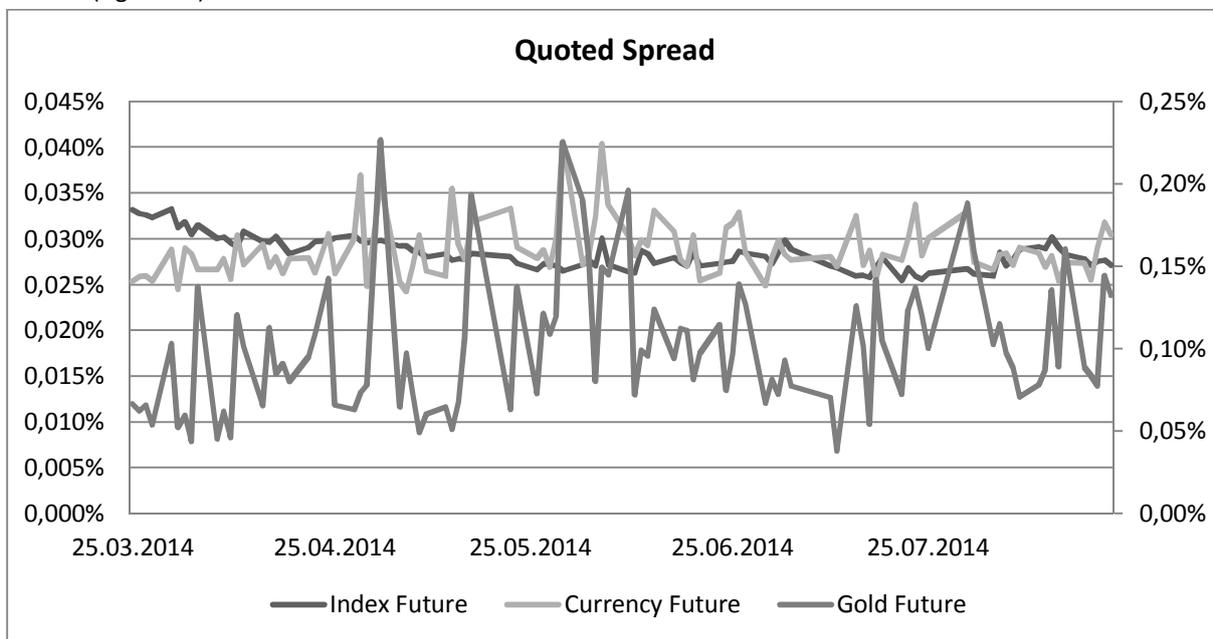


Table 1: Summary Statistics of the Benchmark Spreads and Spread Proxies

This table provides the summary statistics for the estimators considered in this paper. The sample includes 98 trading days data of BIST 30 Index future contract (Index Future), USDTRY future contract (Currency Future) and USD/OUNCE Gold future contract (Gold Future). In addition to Effective Spread and Quoted Spread, the labels refer to the estimators proposed by Roll (Roll, 1984), LOT Mixed (Lesmond, Ogden and Trzcinka, 1999), Effective Tick (Goyenko, Holden, and Trzcinka, 2009; and Holden, 2009), High-Low (Corwin and Schultz, 2012) and Closing Percent Quoted Spread (Chung and Zhang, 2014). Effective Spread is the percentage effective spread and Quoted Spread is time-weighted percentage quoted spread. Both are estimated from intraday trade and quote data. The Roll estimates are calculated by setting positive monthly autocovariance estimates to zero. The Effective Tick is based on the observable price clustering and is a function of the tick increment used in trade prices. LOT Mixed is estimated by maximizing the likelihood function of daily stock returns. High-Low estimator is calculated exactly as in Corwin and Schultz (2012) and Closing Percent Quoted Spread is calculated using daily closing ask and bid prices.

	<i>Effective Spread</i>	<i>Quoted Spread</i>	Roll	LOT Mixed	Effective Tick	High-Low	Closing Percent Quoted Spread
Index Future							
Mean	0.0361%	0.0281%	0.0137%	0.0535%	0.0264%	0.0168%	0.1772%
Median	0.0353%	0.0276%	0.0132%	0.0506%	0.0259%	0.0158%	0.1506%
Standard Deviation	0.0043%	0.0025%	0.0022%	0.0742%	0.0015%	0.0072%	0.1264%
Range	0.0355%	0.0162%	0.0140%	0.7567%	0.0079%	0.0453%	0.9266%
N	98	98	98	98	98	98	98
Currency Future							
Mean	0.0352%	0.0274%	0.0114%	0.0398%	0.0234%	0.2779%	0.4849%
Median	0.0351%	0.0270%	0.0112%	0.0296%	0.0234%	0.2717%	0.4572%
Standard Deviation	0.0044%	0.0019%	0.0044%	0.0378%	0.0003%	0.1158%	0.2454%
Range	0.0218%	0.0094%	0.0284%	0.2401%	0.0018%	0.6703%	1.4349%
N	98	98	98	98	98	98	98
Gold Future							
Mean	0.1441%	0.1019%	0.0389%	0.0116%	0.0710%	0.7377%	0.8305%
Median	0.1327%	0.0976%	0.0407%	0.0096%	0.0651%	0.6878%	0.7827%
Standard Deviation	0.0545%	0.0365%	0.0288%	0.0192%	0.0326%	0.3619%	0.4251%
Range	0.3540%	0.1902%	0.1282%	0.1949%	0.1787%	2.4813%	2.2513%
N	98	98	98	98	98	98	98

Table 2: Correlations for Spread Estimates of Each Contract Compared to the Benchmark Spreads

The sample includes 98 trading day data of BIST 30 Index future contract (Index Future), USDTRY future contract (Currency Future) and USD/OUNCE Gold future contract (Gold Future). Effective spread and Quoted Spread are calculated from every trade and quote data collected from Thomson Reuters Eikon trade and quote screen page. All spread estimators are calculated from daily price data. The labels refer to the spread estimators proposed by Roll (Roll, 1984), LOT Mixed (Lesmond, Ogden and Trzcinka, 1999), Effective Tick (Goyenko, Holden, and Trzcinka, 2009; and Holden, 2009), High-Low (Corwin and Schultz, 2012) and Closing Percent Quoted Spread (Chung and Zhang, 2014). Dashed boxes mean the highest correlation in the row. Bold-faced numbers are statistically significant or have predictive power that is significant at the 5% level.

	Roll	Lot Mixed	Effective Tick	High-Low	Closing Percent Quoted Spread
Index Future					
<i>Effective Spread</i>	40.57%	-8.42%	31.83%	28.05%	16.83%
<i>Quoted Spread</i>	37.03%	-14.69%	73.21%	32.46%	29.86%
Currency Future					
<i>Effective Spread</i>	29.65%	12.40%	32.57%	16.32%	-15.01%
<i>Quoted Spread</i>	42.51%	-0.58%	40.00%	10.63%	-9.98%
Gold Future					
<i>Effective Spread</i>	31.77%	8.28%	77.94%	27.40%	-6.82%
<i>Quoted Spread</i>	46.41%	2.03%	84.02%	3.76%	-9.94%
Average					
<i>Effective Spread</i>	34.00%	4.09%	47.44%	23.92%	-1.67%
<i>Quoted Spread</i>	41.98%	-4.41%	65.74%	6.02%	3.31%

Table 3: Root Mean Square Errors (RMSE) with the Benchmarks

We measure the accuracy of low-frequency spread estimators by computing their RMSEs with respect to the Effective Spread and Quoted Spread for each future contract. The labels refer to the spread estimators proposed by Roll (Roll, 1984), LOT Mixed (Lesmond, Ogden and Trzcinka, 1999), Effective Tick (Goyenko, Holden, and Trzcinka, 2009; and Holden, 2009), High-Low (Corwin and Schultz, 2012) and Closing Percent Quoted Spread (Chung and Zhang, 2014). Dashed boxes mean the lowest RMSE value in the row.

	Roll	Lot Mixed	Effective Tick	High-Low	Closing Percent Quoted Spread
Index Future					
<i>Effective Spread</i>	0.00392%	0.00427%	0.00406%	0.00411%	0.00422%
<i>Quoted Spread</i>	0.00236%	0.00251%	0.00173%	0.00240%	0.00243%
Currency Future					
<i>Effective Spread</i>	0.00426%	0.00443%	0.00422%	0.00440%	0.00441%
<i>Quoted Spread</i>	0.00172%	0.00190%	0.00174%	0.00189%	0.00189%
Gold Future					
<i>Effective Spread</i>	0.05196%	0.05461%	0.03434%	0.05270%	0.05467%
<i>Quoted Spread</i>	0.03252%	0.03670%	0.01991%	0.03669%	0.03653%
Average					
<i>Effective Spread</i>	0.02005%	0.02110%	0.01421%	0.02041%	0.02110%
<i>Quoted Spread</i>	0.01220%	0.01371%	0.00779%	0.01366%	0.01361%